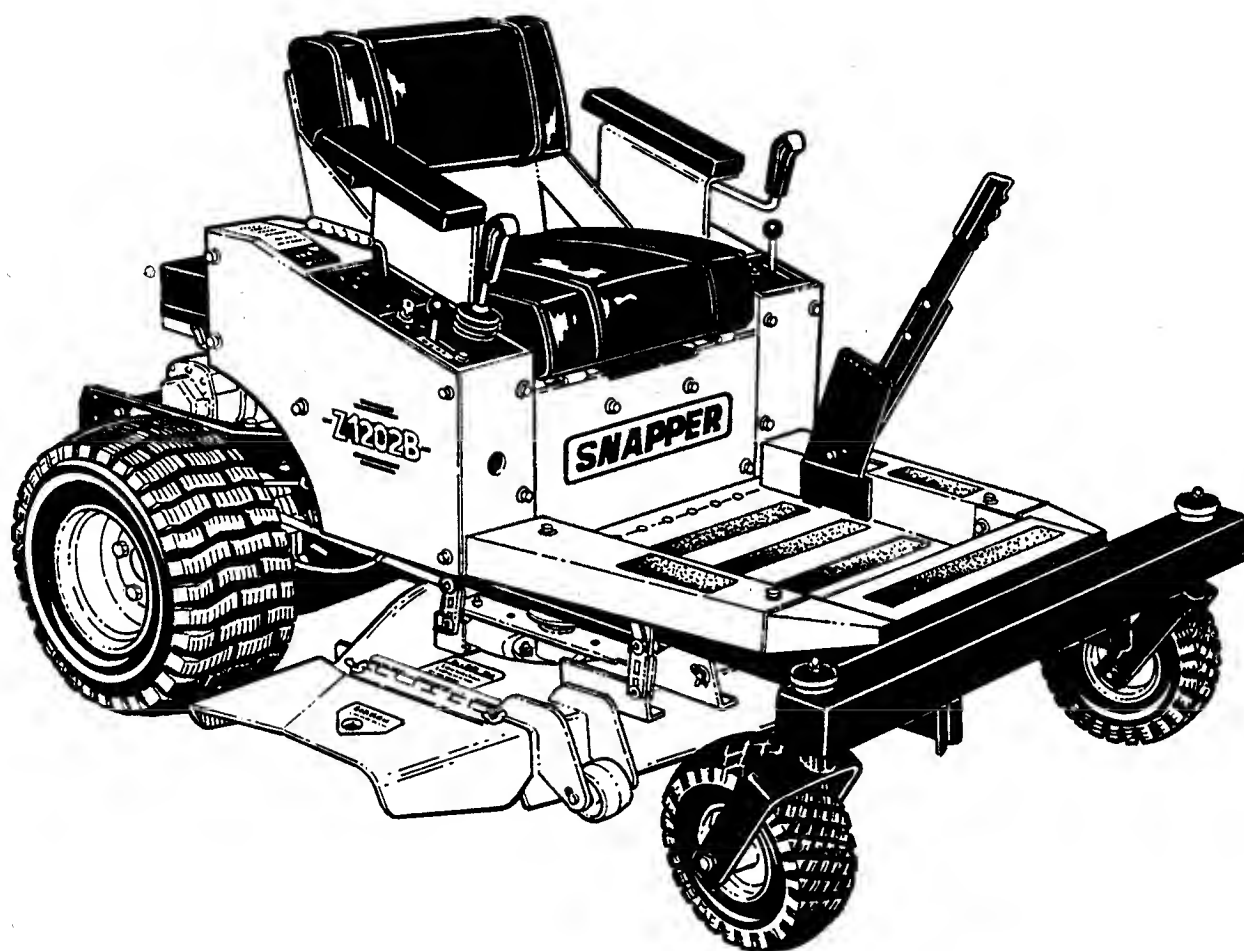


SNAPPER[®]

Zero Turning Radius Mower



SERVICE MANUAL

SNAPPER McDonough, GA., 30253 U.S.A.

MANUAL No. 07220 (I.R. 11/94)

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NOTE

When making repairs that require replacement parts or components, use only original SNAPPER replacement parts to keep the equipment in top operating condition. Refer to the appropriate parts manual for correct part numbers and proper quantities required.

Section I

GENERAL

INFORMATION

Section I - GENERAL INFORMATION

INTRODUCTION

1.1 HOW TO USE THIS MANUAL

This manual contains the Service and Maintenance information required to properly inspect, service and repair the SNAPPER Zero Turning Radius Mowers equipped with 41", 42", 48" and 60" Mower Attachments. The manual is divided into sections for quick, easy reference. Carefully read all procedures described for servicing a particular component **BEFORE** repairs are started, to avoid needless disassembly.

NOTE

References to the RIGHT and LEFT sides are determined by facing forward while sitting on the operator's seat.

1.2 WARNINGS & CAUTIONS

Details of standard workshop safety procedures are not included in this manual. WARNINGS & CAUTIONS occur where procedures, if improperly performed, could cause personal injury, and/or damage to the mower or its components. These WARNINGS & CAUTIONS do not cover all conceivable ways hazardous consequences could be created by improperly following the instructions or by the incorrect use of service tools.

1.3 SERIAL NUMBER LOCATION

The tractor serial number is located on the right rear side of the chassis.

1.4 TOOL REQUIREMENTS

The normal complement of U.S. Standard tools found in most repair shops are all that will normally be needed to repair SNAPPER Zero Turning Radius Mowers. Special tools and meters are mentioned where needed in the manual. Refer to the Parts Manual for special tools available through SNAPPER Dealers.

NOTE

Throughout the following sections of this manual, the word "unit" will be used (in most cases) in lieu of ZERO TURNING RADIUS MOWERS.

1.5 SPECIFICATIONS - GENERAL

A. ENGINE SPECIFICATIONS

Refer to the Engine Manufacturer's Manuals.

B. TRACTOR SPECIFICATIONS

The Zero Turning Radius Mowers covered in this manual will have one of the following drive trains:

1. Hydrostat & Chain-reduction
2. Hydrostat & Gear-reduction
3. Unistat Drive (reduction internal)

Please refer to the Models Identification Chart on Page 1.4 to identify the different units.

C. TIRE SPECIFICATIONS

MODEL Z

Front Tires - 10" - 12 psi / 13" - 12 psi

Rear Tires - 18" - 12 psi / 20" - 12 psi

MODEL ZU

Front Tires - 12 psi

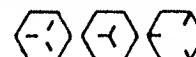
Rear Tires - 12 psi

1.6 SPECIFICATIONS - TORQUE VALUES

Standard Torque Specifications and Capscrew Markings Chart. The values given here are based on the use of clean and dry threads. Reduce torque by 10 percent when threads are lubricated with engine oil and by 20 percent if new plated capscrews are used.

CAPSCREW HEAD MARKINGS

Manufacturer's Marks may vary. Three-line markings on heads shown below - for example, indicate SAE Grade 5.



SAE 1 or 2



SAE 5



SAE 6 or 7



SAE 8

CAPSCREW BODY SIZE Inches - Thread	SAE 1 or 2 Torque Ft - Lb	SAE 5 Torque Ft - Lb	SAE 6 or 7 Torque Ft - Lb	SAE 8 Torque Ft - Lb
1/4 - 20	5	8	10	12
- 28	6	10		14
5/16 - 18	11	17	19	24
- 24	13	19		27
3/8 - 16	18	31	34	44
- 24	20	35		49
7/16 - 14	28	49	55	70
- 20	30	55		78
1/2 - 13	39	75	85	105
- 20	41	85		120
9/16 - 12	51	110	120	155
- 18	55	120		170
5/8 - 11	83	150	167	210
- 18	95	170		240
3/4 - 10	105	270	280	375
- 16	115	295		420

1.7 WORKSHOP SAFETY HINTS

- DO NOT run engine in an enclosed area - exhaust fumes are hazardous to your health.
- DO NOT smoke, light a fire or create any sparks near gasoline - it is extremely flammable.
- DO NOT use gasoline as a solvent. Fumes are dangerous. Always use non-flammable solvents.
- DO NOT store gasoline in an area where sparks or flames are present such as near water heaters or furnaces - gasoline fumes are extremely explosive.
- ALWAYS disconnect the spark plug wires and secure the ends away from the plugs BEFORE inspecting, servicing or repairing the unit or attachments. Precautions prevent accidents such as unintentional start-ups!

Section I - GENERAL INFORMATION

- F. ALWAYS make adjustments and do repairs in a well lit and well-ventilated area.
 - G. ALWAYS wear protective safety goggles when using pressurized air to clean the machine or parts.
 - H. DO NOT use a jack to support the unit in a raised position. Use "jack stands" or other stable supports that will hold up BOTH sides of the frame at the same time. This approach is especially important when raising and supporting the rear end of the unit. With the front axle pivot, both sides of the frame must be securely supported. Be sure to chock (block) the wheels that remain on the surface.
-

NOTE

Read the Operator's & Engine Owner's Manuals and instructions BEFORE operating equipment.

Section I - GENERAL INFORMATION

Models Identification Chart:

Hydrostat & Chain-reduction Models

<u>Model</u>	<u>HP</u>	<u>Control</u>	<u>Deck Mount Style</u>	<u>Year</u>	<u>42"</u>	<u>48"</u>	<u>60"</u>
Z120T	12	2-Lever	NC-RDB	'89	Z4200M	*	*
Z1251BVJ	12	Joystick	WC-RDB-EF	'90	Z4201M	*	*
Z1251BV	12	2-Lever	WC-RDB-EF	'90	Z4201M	*	*
Z140T	14	2-Lever	NC-RDB	'89	Z4200M	Z4800M	*
Z160T	16	2-Lever	NC-RDB	'89	Z4200M	Z4800M	*
Z180T	18	2-Lever	NC-RDB	'89	Z4200M	Z4800M	*
Z1401K	14	2-Lever	WC-RDB-EF	'90	Z4201M	Z4801M	*
Z1801K	18	2-Lever	WC-RDB-EF	'90	Z4201M	Z4801M	*
Z1800T	18	2-Lever	WC-RDB-LF	'90	*	*	*
Z2001K	20	2-Lever	WC-RDB-EF	'90	Z4201M	Z4801M	*
Z2010K	20	2-Lever	WC-RDB-LF	'89	*	*	Z6000M

Hydrostat & Gear-reduction Models

<u>Model</u>	<u>HP</u>	<u>Control</u>	<u>Deck Mount Style</u>	<u>Year</u>	<u>41"</u>	<u>42"</u>	<u>48"</u>	<u>60"</u>
Z1202B	12	Joystick	WC-FDB	'91-'92	Z4102M	*	*	*
Z1203B	12	Joystick	WC-FDB	'93-'94	Z4102M	*	*	*
Z1402K	14	Joystick	WC-FDB	'91-'92	*	Z4202M	Z4802M	*
Z1403K	14	Joystick	WC-FDB	'93-'94	*	Z4202M	Z4802M	*
Z1802K	18	Joystick	WC-FDB	'91-'92	*	Z4202M	Z4802M	Z6002M
Z1803K	18	Joystick	WC-FDB	'93-'94	*	Z4202M	Z4802M	Z6002M
Z2002K	20	Joystick	WC-FDB	'91-'92	*	Z4202M	Z4802M	Z6002M
Z2003K	20	Joystick	WC-FDB	'93-'94	*	Z4202M	Z4802M	Z6002M

Unistat Driven Models

<u>Model</u>	<u>HP</u>	<u>Control</u>	<u>Deck Mount Style</u>	<u>Year</u>	<u>48"</u>	<u>60"</u>
1810	18	2-Lever	NCU-RDB	'89	ZU4803M	*
2010	20	2-Lever	NCU-RDB	'89	ZU4803M	*
ZU1803K	18	2-Lever	NCU-RDB	'90-'91	ZU4803M	*
ZU2003K	20	2-Lever	NCU-RDB	'90-'91	ZU4803M	*
ZU2013K	20	2-Lever	WCU-RDB-EF	'92	ZU4813M-WC-BLK	ZU6003M-WC-BLK
ZU2014K	20	Joystick	WC-FDB, WCU-FDB	'93	ZU4804M, Z4802M	ZU6004M, Z6002M

Key: NC = Narrow Carriage Mounting, lift arms found inside frame.
 WC = Wide Carriage Mounting, lift arms found outside frame.
 NCU = Narrow Carriage Mounting for Unistat ZTR only.
 WCU = Wide Carriage mounting for Unistat only.
 RDB = Rear Drag Bar, mounts at rear of deck.
 FDB = Front Drag Bar, mounts at front of deck.
 BLK = Black in color.
 LF = Long Frame
 EF = Extended Short Frame

NOTES

1. All decks are painted red with the exception of decks made specifically for the Unistat Driven Models.
2. 48" & 60" red decks made for the Hydrostat & Gear-reduction Models may be mounted to the ZU2014K only. (will not fit other Unistat Driven Models).
3. All black decks are manufactured with spindles with a top seal, red decks utilize seals of top bearing.

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Section II

TROUBLESHOOTING

Section II - TROUBLESHOOTING

ENGINE

1. ENGINE WON'T TURN OVER

Mower blades engaged	Disengage blades.
Drive not in neutral	Move Joystick to neutral "DOWN" position or, on 2-lever units, move levers "OUTWARD".
Blown fuse	Replace fuse.
Dead battery	Charge or replace.
Solenoid faulty	Test/replace.
Ignition switch faulty	Test/replace.
Starter faulty	Refer to Engine Manual.
Neutral Switches faulty	Test/replace.

2. ENGINE WILL TURN OVER, BUT WON'T START

No fuel.	Refuel, clean/replace fuel filters.
Over or under choked	Adjust choke.
Spark plug not firing	Check spark plug. Regap.
Carburetor out of adjustment	Adjust carburetor.
Ignition switch faulty	Test/replace.

3. ENGINE HARD TO START

Fuel line clogged	Clean fuel line. Check fuel filter.
Faulty fuel pump	Refer to Engine Manual.
Spark plug wire loose or grounded	Check spark plug wires.
Spark plug(s) faulty or improperly gapped	Check spark plug. Regap.
Electronic ignition defective	Refer to Engine Manual.
Dirty or maladjusted carburetor	Clean/adjust carburetor.
Dirty air filter	Clean or replace air filter.

4. ENGINE STARTS, BUT CUTS OUT

Water in fuel.	Drain fuel, clean carburetor. Fill with fresh fuel.
Clogged fuel line	Clean fuel line. Check fuel filter.
Vent in fuel cap plugged	Check/clean vent.
Faulty fuel pump	Refer to Engine Manual.
Carburetor out of adjustment	Adjust carburetor.
Engine stalls when Joystick is raised	Park brake set. Release brake.

5. ENGINE KNOCKS

Low oil level.	Check oil. Add oil.
Ignition timing off.	Refer to Engine Manual.
Fuel octane grade too low	Drain fuel. Fill tank with higher octane fuel.
Engine over-heated	Stop engine. Allow to cool.

6. ENGINE SOMETIMES SKIPS AT HIGHER SPEEDS

Incorrect ignition timing	Refer to Engine Manual.
Carburetor out of adjustment	Adjust carburetor.
Faulty spark plug(s)	Check spark plug(s). Regap.
Bouncing off seat. Switch breaking circuit	Slow down on rough terrain, check condition of seat switch.

Section II - TROUBLESHOOTING

7. ENGINE OVERHEATED

Air intake or cooling fins clogged	Clean intake screen and fins.
Fuel mixture too lean	Adjust carburetor.
Oil level too high or too low	Adjust oil level.
Improper ignition timing	Refer to Engine Manual.
Running engine too slow	Increase engine speed.

8. ENGINE IDLES POORLY

Carburetor out of adjustment	Adjust carburetor.
Improper spark plug gap	Check plug. Regap.
Air filter dirty	Clean/replace air filter.

9. ENGINE BACKFIRES

Carburetor out of adjustment	Adjust carburetor.
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10. MOWER LOSES POWER OR TRANSMISSION OVERHEATS

Parking brake not releasing	Disengage park brake.
Transmission oil low	Add oil.
Damaged transmission	Replace transmission.
Defective high pressure relief valve (HPRV)	Replace HPRV (See Page 8.10).
Loose belt	Adjust belt.

TRANSMISSION

1. ENGINE RUNS, BUT MOWER WON'T MOVE FORWARD OR IN REVERSE

Drive belt loose or broken	Adjust belt/replace.
Shift linkage cable disconnected	Connect cable.
Transmission shift arm disconnected	Connect shift arm.
Transmission oil low	Add oil.
Transmission locks in "UNLOCK" position	Put in "LOCK" position.
Malfunctioning transmission	Replace transmission.
Control linkage to hydro out of adjustment	Adjust control linkage.
Dump valve on hydro not fully released	Release dump valve.
Parking brake is set	Release park brake.
Control arm roll pin is broken or missing	Replace roll pin.
Defective Hi-pressure relief valve (HPRV)	Replace HPRV.

2. TRANSMISSION IS OVERHEATING

Oil level low	Check/add oil.
Oil is of wrong type	Drain. Replace with specified oil. See Owner's Manual.
Cooling fins on hydro are clogged	Clean fins.
Broken cooling fan blades	Replace cooling fan.
Exceeding load rating for tractor	Reduce load.
Parking brake not fully released	Release park brake.
Clogged oil filter	Replace filter.

3. BRAKE FAILS TO STOP VEHICLE OR HOLD ON HILLS

Brake lever rod out of adjustment	Adjust brake lever rod.
Brake pucks worn	Replace pucks.
Brake band worn	Replace band.

Section II - TROUBLESHOOTING

4. TRANSMISSION LEAKS OIL OR GREASE

- Oil reservoir base on top of reservoir loose (Model BDU10S Tighten base. Torque to 100-120 inch/lbs.
- Loose hose clamps or fittings Tighten hose/fittings.
- Oil leaks from shaft seals Refer to Transmission Manual.
- Transmission housings loose. Torque housing bolts to 120-160 inch/lbs.
- Transmission control shaft seal faulty. Replace seal.

TRANSMISSION (UNISTAT)

1. TRACTOR WILL NOT MOVE FORWARD OR IN REVERSE

- Control linkage to hydro out of adjustment. Adjust control linkage.
- Oil level low Check/add oil.
- Dump valves are open. Close valves.
- Input drive belt is slipping or broken. Adjust/replace belt.
- Parking brake is set Release park brake.
- High pressure valve "O" ring failed Replace "O" ring.

2. TRANSMISSION IS OVERHEATING

- Oil level low Add oil.
- Oil is of wrong type. Drain. Replace with specified oil.
- Oil filter clogged. Replace oil filter.
- Cooling fins on Unistat clogged Clean cooling fins.
- Exceeding load rating for tractor. Reduce load.
- Parking brake not fully released. Release park brake.

3. PARK BRAKE FAILS TO HOLD VEHICLE

- Faulty transmission. Replace transmission. See Page 8.10.
- Faulty park brake valve. Repair/replace valve.
- Faulty hydraulic hose or fitting Repair/replace.

4. PARK LOCK PIN DOESN'T RELEASE/RELEASES SLOWLY

- Return hose restricted. Remove obstruction. Install 3/8" hose.

STEERING (JOYSTICK/UNISTAT)

1. MOWER PULLS TO ONE SIDE WHILE OPERATING

- Control cable out of adjustment Adjust control cable.
- A. Outside cable controls right wheel
- B. Inside cable controls left wheel
- Transmission dump valve not fully closed. Close dump valve.
- "O" ring in dump valve is damaged. Replace "O" ring.
- Second stage drive belt is loose. Tighten drive belt.

2. MOWER CONTINUES TRAVEL WITH JOYSTICK IN NEUTRAL

- Control cable out of adjustment. Adjust control cable.
- A. Outside cable controls right wheel
- B. Inside cable controls left wheel
- Unistat shift block out of adjustment Rotate shift block to next hole.

Section II - TROUBLESHOOTING

3. SLOW OR NO RESPONSE TO MOVEMENT OF JOYSTICK

Joystick pivot block worn	Rebuild/replace pivot block.
Joystick pivot block out of adjustment	Adjust pivot block.
Control cable out of adjustment	Adjust control cable.
Both dump valves are open.	Close dump valves.
Drive belt loose or broken.	Adjust/replace belt.
Spacers worn	Replace spacers.
Cable belts loose or missing.	Tighten/replace.

4. JOYSTICK DIFFICULT TO MOVE (METAL PIVOT BLOCK)

Lubrication of pivot block required	Lubricate pivot block with Teflon spray lube.
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STEERING (TWO-HANDLE CONTROLS/UNISTAT)

1. MOWER PULLS TO ONE SIDE WHILE OPERATING

Transmission dump valve not fully closed	Close dump valve.
"O" ring in HPRV valve is damaged	Replace "O" ring. See Page 8.10.
Drive belt is loose	Adjust drive belt.
Pivot stop out of adjustment	Adjust pivot block.
Rotary mount block out of adjustment	Adjust mount block.
Primary belt loose or improperly tensioned.	Adjust drive belt.

2. MOWER CREEPS WHEN STEERING LEVERS ARE IN NEUTRAL

Rotary mount block out of adjustment	Adjust mount block.
Neutral return block out of adjustment	Adjust neutral return block.
Rod out of adjustment	Adjust rod.

3. STEERING HANDLE FAILS TO RETURN TO NEUTRAL WHEN RELEASED

Transmission internal N-R device worn.	Replace transmission.
Obstruction in control linkage.	Replace obstruction.

CUTTER UNIT

1. MOWS IMPROPERLY

Dull blades	Sharpen blades.
Uneven tire pressure.	Inflate tires to specifications.
Deck out of level.	Level deck.
Deck belt slipping.	Adjust deck belt/check idler arm & loosen if necessary.
Engine speed too low.	Increase engine speed.
Blades bent	Replace blades.

2. EXCESSIVE NOISE OR VIBRATION WITH BLADES ENGAGED

Blades out of balance.	Balance blades.
Spindle bearings dry or worn out	Lubricate/replace.
Idler bushing worn.	Replace bushing.

3. EXCESSIVE BELT WEAR

Wrong belt installed.	Install correct belt.
Wrong double idler installed.	Install correct double idler.
Idler arm bent.	Straighten idler arm/replace.

Section II - TROUBLESHOOTING

- 4. DECK CASTER WHEEL WILL NOT SWIVEL (60" DECK)
 - Bearings dry or worn out Lubricate/replace.
 - Swivel assembly deformed Replace assembly.
- 5. EXCESSIVE "DUSTING" DURING ARID TIMES OF YEAR
 - Standard lip baffle kit installed on deck Install new dust baffle kit.
 - Underside of deck full of impacted grass Clean underside of deck.

Section III
ELECTRICAL
SYSTEM

Section III - ELECTRICAL SYSTEM

INTRODUCTION

The electrical system of the Zero Turning Radius Mower consists of three circuits which are the ignition, charging and starting circuits. This section covers the starting circuit only. Refer to the engine manuals for information concerning the ignition and charging circuits - these are internal engine circuits.

STARTING CIRCUIT (Principle of Operation)

The safety interlock system is an electrical loop containing four interlock switches; seat, clutch (or mower blade) brake and steering control switch. The four switches MUST be closed at the same time before the engine can be started. If any of the four are open, the circuit will not be grounded and the starting solenoid can not be activated.

After the engine has been started, the clutch switch (mower blade) brake switch and steering control switch can be opened. The key switch must remain closed (in run position) and the operator must remain in the seat to keep the seat switch closed. The interlock system will "kill" the engine if the operator vacates the seat UNLESS the clutch switch (mower blade) has been turned off, the steering control placed in neutral and the parking brake set. Figure 3.1 shows the starter system configuration.

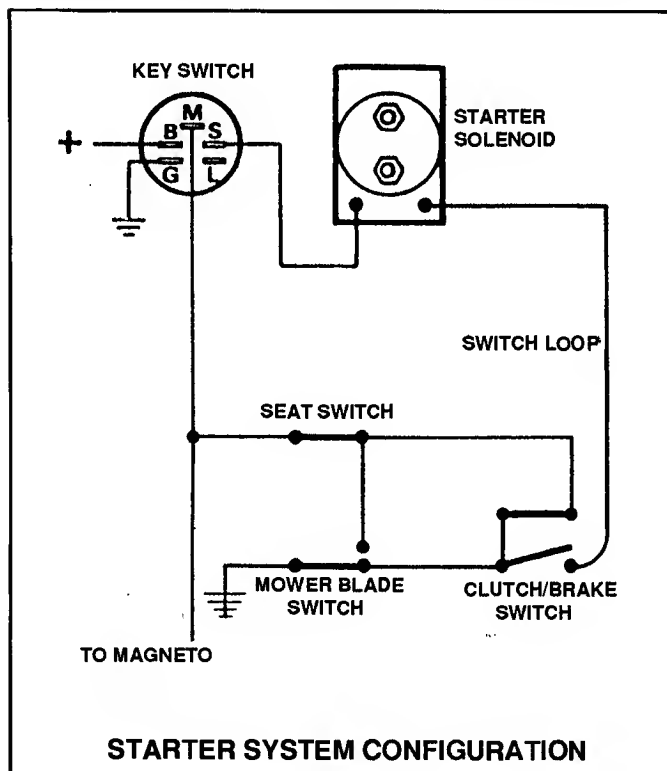


FIGURE 3.1

3.1 BATTERY SERVICE

A. Most dry charge type battery problems result from improper activation practices and/or the lack of proper battery maintenance. Activate as follows:

1. Before activating the battery, remove it from the tractor. See Figure 3.3A. Never attempt to

pour electrolyte into a new battery when it is mounted on the equipment.

2. After removing battery from tractor, place the battery on a level surface and make sure the cap vent holes are open to permit gas to escape during battery charging.

WARNING!

Battery acid (electrolyte) is corrosive!
Use care when handling!

3. Remove the caps and fill each cell with 1.265 ($\pm .05$) specific gravity battery grade electrolyte to a level that is no more than 3/16" above the top of the plates. See Figure 3.2.

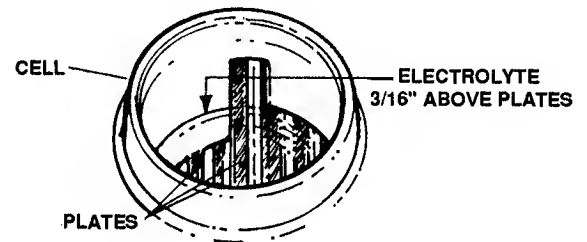


FIGURE 3.2

NOTE

The battery and electrolyte should be at least 70 degrees Fahrenheit prior to filling. Allow 30 minutes to set, then add electrolyte as needed to bring the level back up to 3/16" above plate level. Reinstall caps.

NOTE

Never overfill the battery cells. Maintain the level at NO MORE than 3/16" above the plates. Use distilled water to restore correct level. If over-filled, the liquid can overflow and reach the battery terminals creating a path for electrical discharge and, also cause corrosion and deterioration of metal parts. Should corrosion occur, clean terminals with a wire brush, then coat them with petroleum jelly.

4. The recommended rate of charge is 1 Amp for ten hours. If time will not allow this, charge at three Amps for four hours. Due to the length of time required, it is not practical to attempt charging a new battery with the tractor engine. NEVER USE BOOST CHARGERS!

WARNING!

HYDROGEN IS EXPLOSIVE! Do not charge batteries around open flames or sparks!

Section III - ELECTRICAL SYSTEM

5. After the battery has been properly activated, inspect it for leaks and electrolyte on surfaces. Clean and dry all surfaces before installing in tractor.
6. **ALWAYS** connect the Positive (+) cable to the Positive battery terminal **BEFORE** attaching the Negative (-) cable to the Negative terminal. This procedure will prevent accidental arcing should a wrench or pliers touch the tractor frame during removal or installation. **ALWAYS** disconnect the Negative (-) ground terminal first. See Figure 3.3.

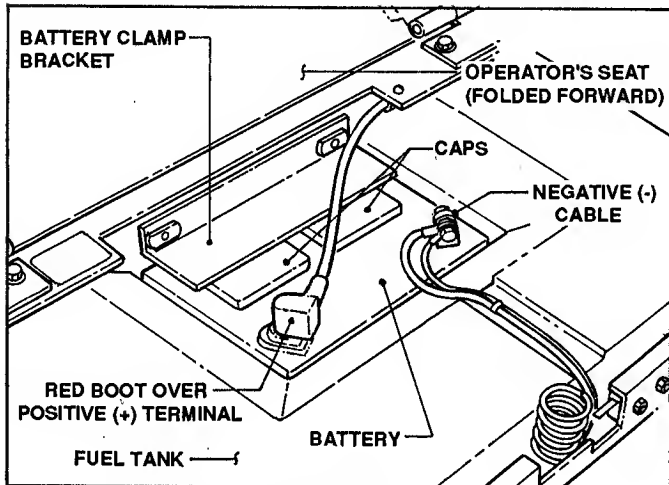


FIGURE 3.3

B. BATTERY REMOVAL

1. Tilt seat forward.
2. Disconnect negative (black wire) terminal.
3. Slide protective boot aside and disconnect the positive (red wire) terminal.

WARNING

ALWAYS disconnect negative (black wire) FIRST! ALWAYS connect the negative wire LAST!

4. Tilt the seat back to the operating position.
5. Remove the battery clamp angle screws from the front panel.
6. Tilt seat forward again.
7. Remove battery clamp angle.
8. Remove battery. See Figure 3.3A.

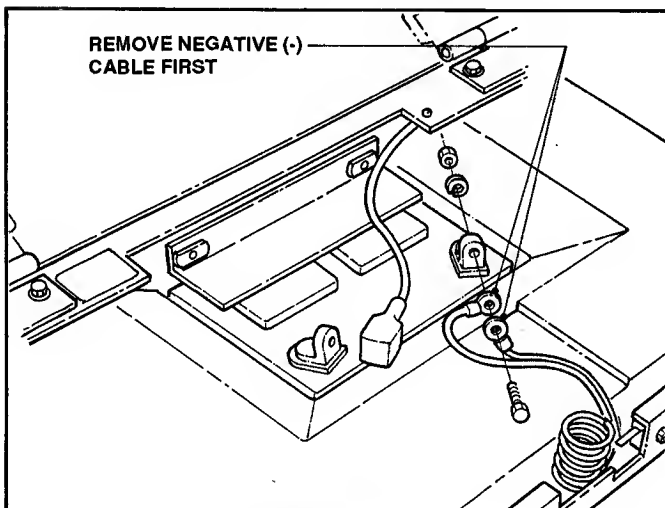


FIGURE 3.3A

9. Reinstall battery in reverse order.

C. BATTERY TESTING

A battery which does not perform properly is not necessarily worn out or defective. It may only need to be removed from the unit and brought up to full charge with a battery charger. If battery trouble is still suspected after being fully charged, tests should be performed.

If the battery is producing 12 volts and the cables have continuity, the remainder of the starting system can be systematically tested. A complete check includes cleaning and testing the charge with a hydrometer. The battery must be properly serviced as described earlier before testing.

D. TESTING WITH VOLTMETER

Test battery voltage with a Voltmeter (VOM). Set meter on DC Volts. Place the red probe on the Positive (+) terminal and the black probe on the Negative (-) terminal. Refer to the chart for test indications. See Figure 3.4.

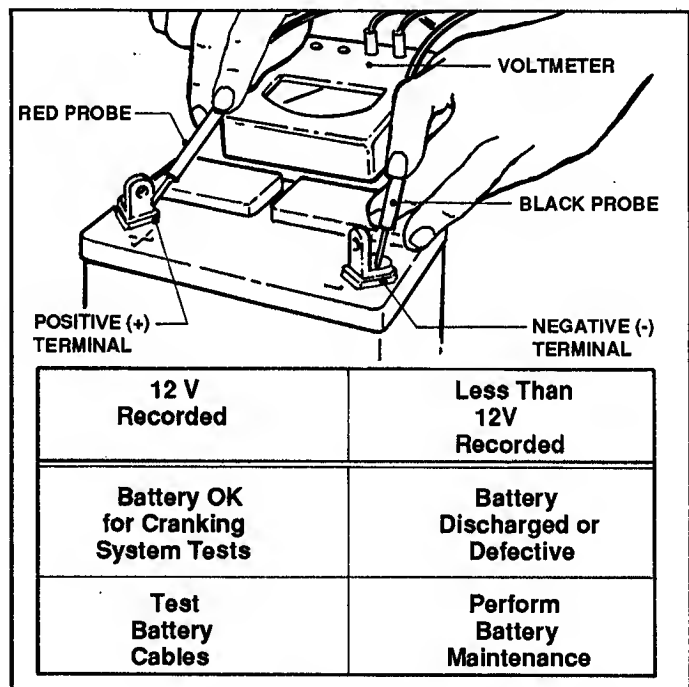


FIGURE 3.4

E. TESTING WITH HYDROMETER

Test the specific gravity of the battery's electrolyte with a hydrometer. If the reading is less than 1.225, the battery should be recharged before further testing can be done. If the battery fails to accept a charge, it is not serviceable and should be replaced. Cease testing if this is the case. See Figure 3.5.

NOTE

Hydrometers are generally calibrated to give a correct reading only at 80° F. When taking a reading at other temperatures, a correction factor must be used. This factor is approximately 0.004 (4 points) specific gravity. For each 10 degrees above 80°F, ADD 4 points. For each 10 degrees below 80°F, SUBTRACT 4 points. Always correct the readings for temperature variations. Test specific gravity of each cell.

Section III - ELECTRICAL SYSTEM

To read the hydrometer correctly, position the top surface of the electrolyte in the hydrometer at eye level. Disregard the curvature of the liquid where the surface rises against the float.

EXAMPLE

Hydrometer reading is.1.240
Temperature is.....0°F

Degrees different
than
80°.....30

Number of 10° intervals.....3

Times Correction
factor..... 3 x 0.004
Correction.....0.012

(Correction is subtracted when
temperature is lower than 80°)

.....-0.012

Corrected Hydrometer Reading
.....1.228

A fully charged battery should
have a specific gravity reading
above 1.225 in all cells before
performing full high rate discharge
test.

HYDROMETER



THERMOMETER

HYDROMETER

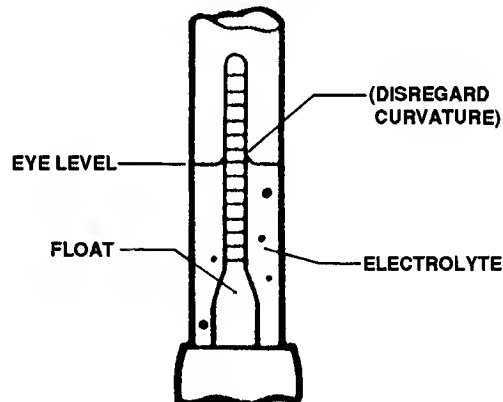


FIGURE 3.5

Perform the hydrometer specific gravity test as follows: Carefully insert tip of the hydrometer into the cell to avoid damaging the separators. Broken separators could result in premature failure of the battery. Squeeze bulb and draw in only enough electrolyte to keep the float from touching the bottom of the hydrometer barrel when

the bulb is released. Keep hydrometer in a vertical position while drawing in liquid and while taking the reading. Test each cell. Refer to the BATTERY TESTING CHART on page 3.5 for analysis of test readings.

Section III - ELECTRICAL SYSTEM

F. BATTERY TESTING CHART

HYDROMETER TEST @ 80°F (27.7°C)	STATE OF CHARGE OR BATTERY CONDITION	CORRECTION OR REMEDY
1. 1.215 Specific Gravity	1. Probably Good	1. No correction required if variation among cells not over .050 Specific Gravity. Give High Rate Discharge Capacity Test. If test O.K., check operation and setting of voltage regulator. Make a thorough check of the electrical system for short circuits, loose connections, corroded terminals etc.
2. Less than 1.215 Specific Gravity	2. Questionable	2. Recharge Battery. After recharge, repeat step #1.
3. Cells showing more than 50 points (.050) Specific Gravity variation.	3. (A) Short circuit in low cell. (B) Loss of electrolyte by leak or excessive over-charge. (C) Improper addition of electrolyte or contaminants (D) Natural or premature battery failure (E) Cracked box partition	3. Recharge battery. If .050 Specific Gravity variation persists, replace battery. If battery accepts charge and variation does not persist, repeat step #1.
OPEN CIRCUIT VOLTAGE TEST	STATE OF CHARGE OR BATTERY CONDITION	CORRECTION OR REMEDY
4. Battery or cells showing more than half charge.	4. Probably good.	4. Apply remedy given for #1.
5. Battery or cells showing less than half charge but not more than .05 volts variation.	5. Questionable	5. Apply remedy given for #2.
6. If cell connectors are accessible, cells showing more than .05 variation.	6. See #3	6. Apply remedy given for #3.
HIGH RATE DISCHARGE TEST		
7. Use High Rate Discharge Tester in accordance with manufacturer's recommendations. (See electrical diagram below for points of common difficulties.)		

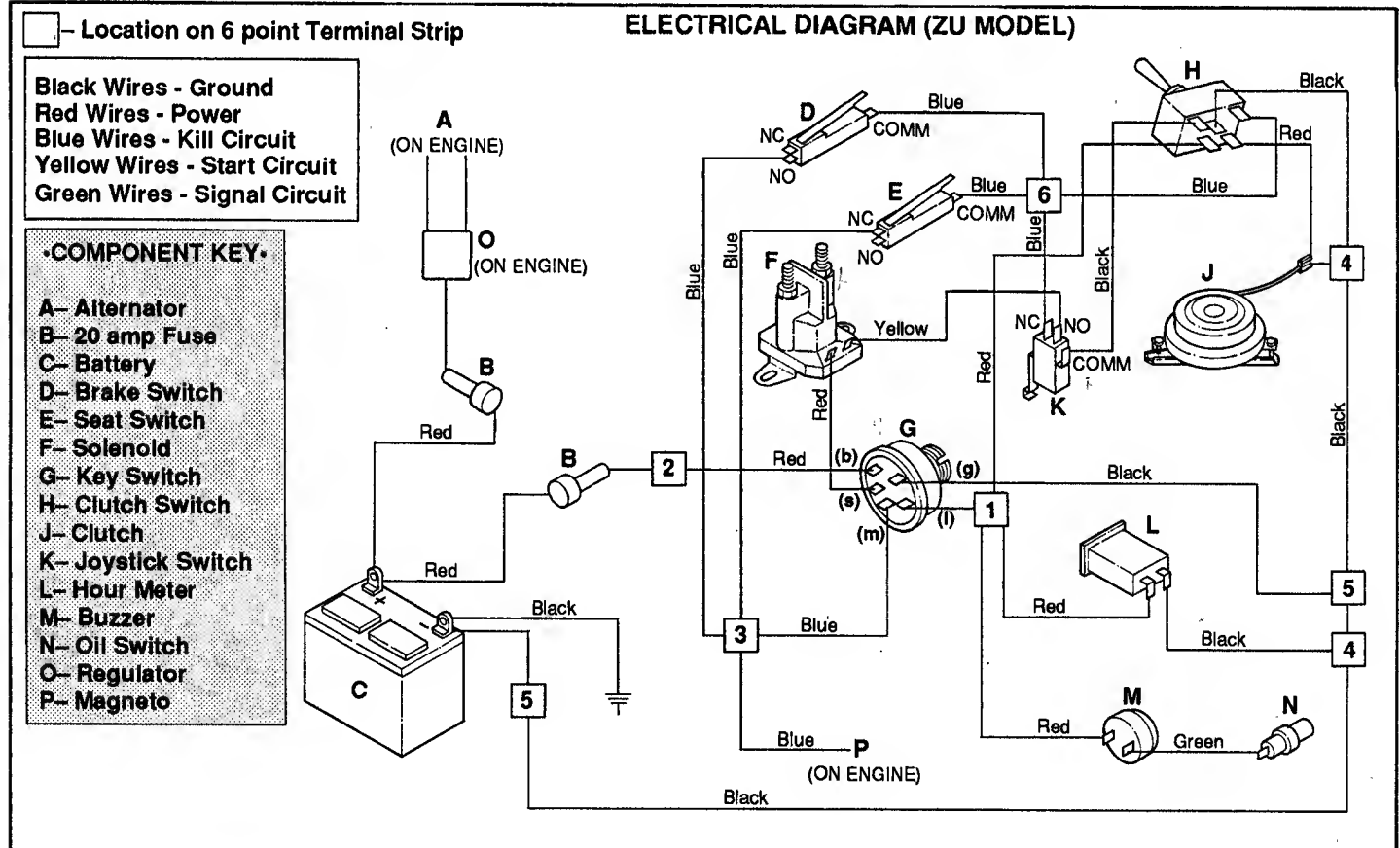


FIGURE 3.6

Section III - ELECTRICAL SYSTEM

Location on 6 point Terminal Strip

ELECTRICAL DIAGRAM (Z MODEL)

NOTE:
ANTI-BACKFIRE (ORANGE
WIRE) USED ON BRIGGS
TWINs

COMPONENT KEY

- A - Anti - Backfire
- B - Fuse
- C - Battery
- D - Starter
- E - Seat Switch
- F - Solenoid
- G - Key Switch
- H - Clutch Switch
- J - Clutch
- K - Neutral Switch
- L - Hour Meter
- M - Buzzer
- N - Oil Switch
- O - Regulator
- P - Magneto
- Q - Headlight Switch
- R - Headlights

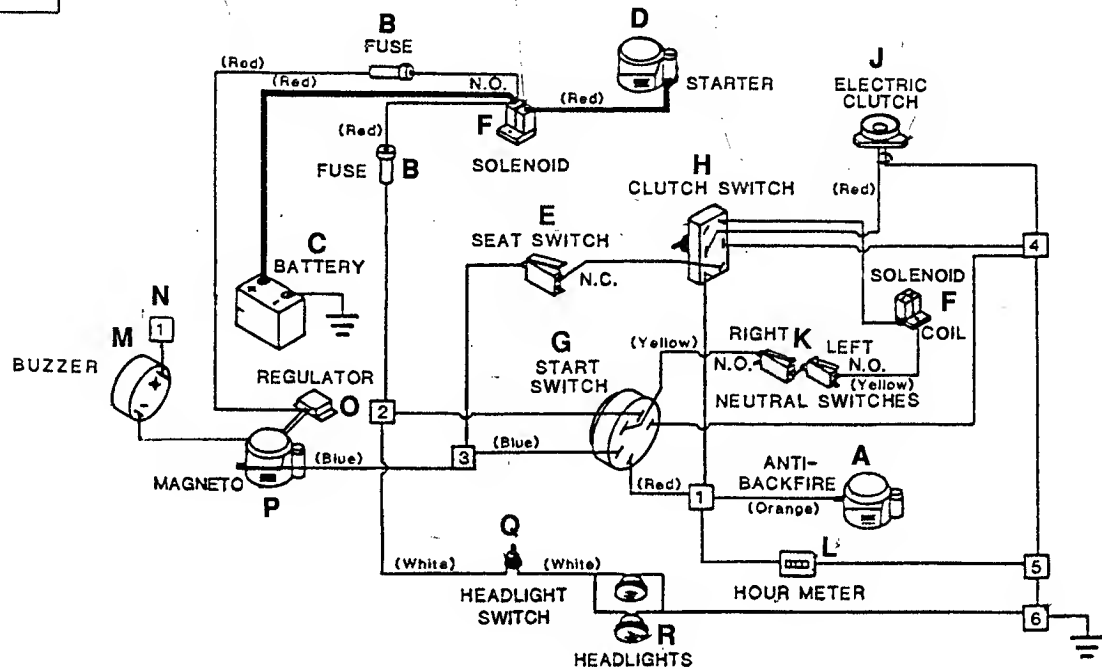


FIGURE 3.7

Section III - ELECTRICAL SYSTEM

3.2 INTERLOCK SYSTEM ANALYSIS

A. KEY SWITCH

1. Disconnect wires from the switch terminals. See Figure 3.8.
2. Place the switch in the OFF position. Connect continuity light to "M" and "G" terminals only - there should be contact.
3. Place the switch in ON position and connect the light to the "B" and "L" terminals only - there should be contact.
4. Hold the switch in the START position after connecting the light to terminals "B" and "S" - there should be contact.
5. Reconnect harness wires to switch terminals after completing test.

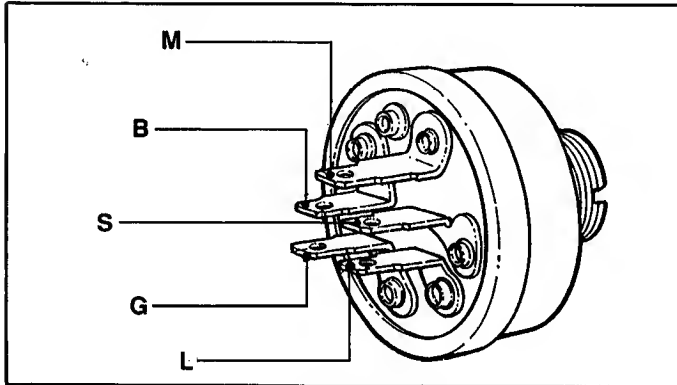


FIGURE 3.8

B. SOLENOID TEST

1. Disconnect all wires from the solenoid. See Figure 3.9.
2. Connect the continuity light to both threaded terminals.
3. Now apply 12 Volts to the two plug terminals. The solenoid should click and the continuity light should come on.
4. Reconnect wires to proper terminals.

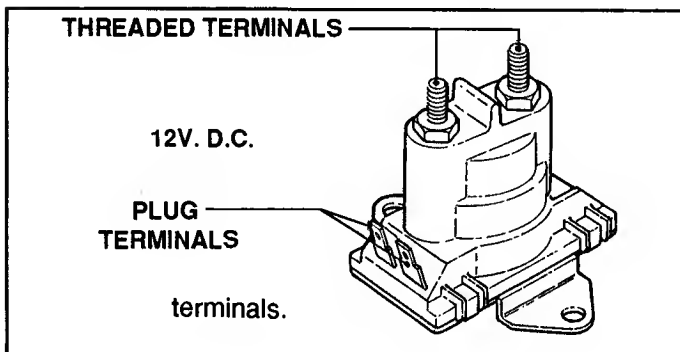


FIGURE 3.9

C. SEAT SWITCH TEST

1. Disconnect wire connectors from terminals. See Figure 3.10.
2. Attach continuity light wires to the NC and COMM terminals. When the switch is depressed (making the circuit) the light should come on.
3. Reconnect wires to the seat switch.

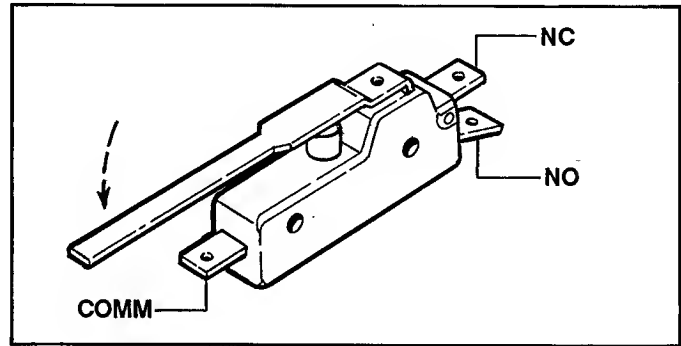


FIGURE 3.10

D. CLUTCH SWITCH TESTS

1. Disconnect wires from the switch terminals. See Figure 3.11.
2. Place switch in OFF position and connect tester wires to the #4 and #5 terminals only - the light should come on.
3. Place switch in ON position and connect tester wires to the #1 and #3 terminals only - the light should come on.
4. Reconnect wires to the proper terminals.

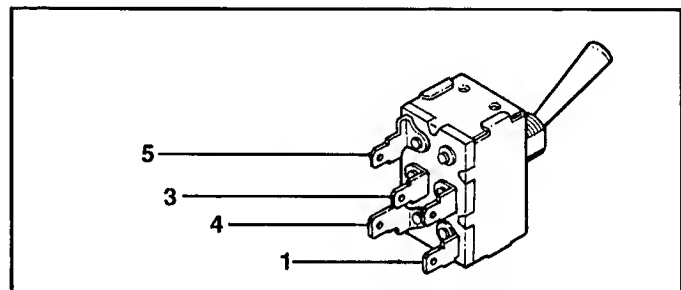


FIGURE 3.11

E. JOYSTICK SWITCH TEST

1. Disconnect wire connectors from terminals. See Figure 3.12.
2. Push the joystick DOWN and connect tester wires to the NC and COMM terminals - the light should come on.
3. Pull the joystick UP and connect tester wires to the NO and COMM terminals - the light should come on.

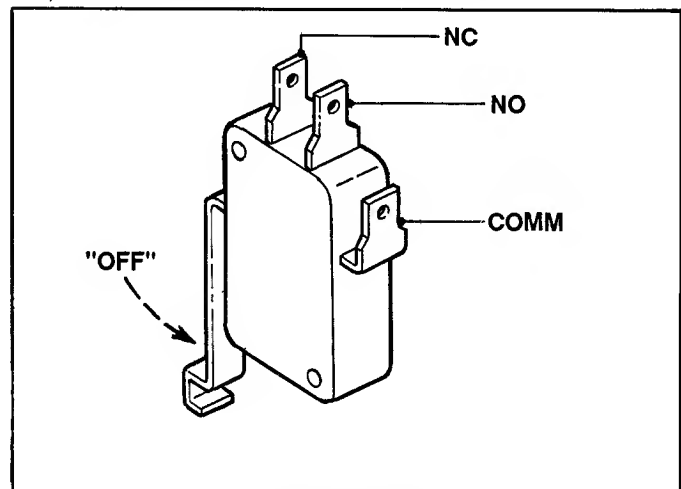


FIGURE 3.12

Section III - ELECTRICAL SYSTEM

F. BRAKE SWITCH TEST

1. Disconnect wire connectors from terminals. See Figure 3.13.
2. Attach continuity light wires to the NO and COMM terminals. When the switch is released (making the circuit) the light should come on.
3. Reconnect wires to the seat switch.

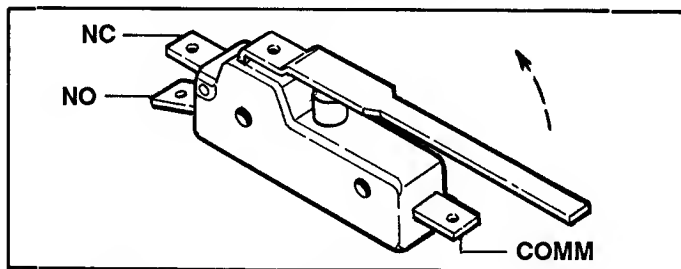


FIGURE 3.13

G. OIL SWITCH TEST

1. Disconnect wire connector from terminal. See Figure 3.14.
2. Connect tester wires to terminal and steel deck plate. If light on tester glows, switch is good. If light does not glow, replace oil switch.

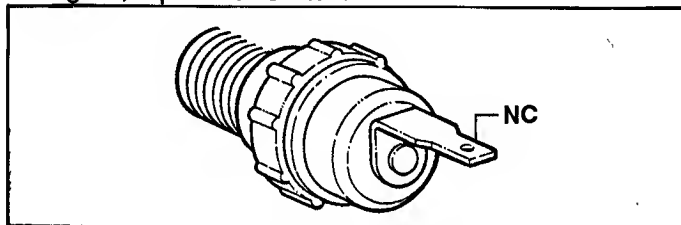


FIGURE 3.14

H. ELECTRIC CLUTCH TESTS

(MEASURE CLUTCH FIELD COIL)

1. Turn clutch switch and engine switch OFF.
2. Disconnect clutch wire connectors. See Figure 3.15.

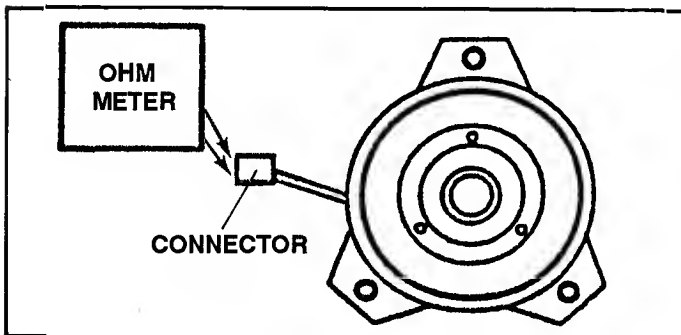


FIGURE 3.15

(CLUTCH FIELD COIL RESISTANCE)

3. Connect OHM meter leads to the two wires in the clutch connector. Refer to Figure 3.15.
4. If the meter reading is BELOW 2.40 OHMs or ABOVE 3.40 OHMs resistance, the clutch has failed and must be replaced.
5. If the meter reads between 2.40 and 3.40 OHMs resistance, proceed with the CLUTCH CURRENT DRAW test.

(MEASURE CLUTCH CURRENT DRAW)

1. With the engine switch and clutch switch OFF, disconnect the clutch wire connector. See Figure 3.16.

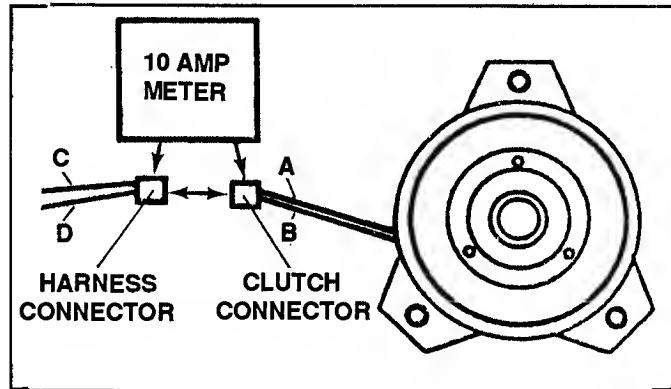


FIGURE 3.16 (CLUTCH CURRENT DRAW)

2. Use an AMP meter with a 10 AMP scale. Connect one meter lead to clutch connector wire "A" and connect the other meter lead to wire "C" in the harness connector.
3. Connect a short jumper wire to the wire "B" in the clutch connector and to wire "D" in the harness connector.
4. Turn clutch switch ON.
5. If the meter reads BELOW 3.5 AMPS, the electrical system has a problem (battery, relay, switches, etc.). Check the electrical system.
6. If the meter reads 3.5 AMPS to 4.5 AMPS, proceed to the AIR GAP SETTING instructions.

(CHECK AIR GAP SETTING)

1. With the engine switch and clutch switch OFF, locate the three air gap check "slots" as shown. See Figure 3.17.

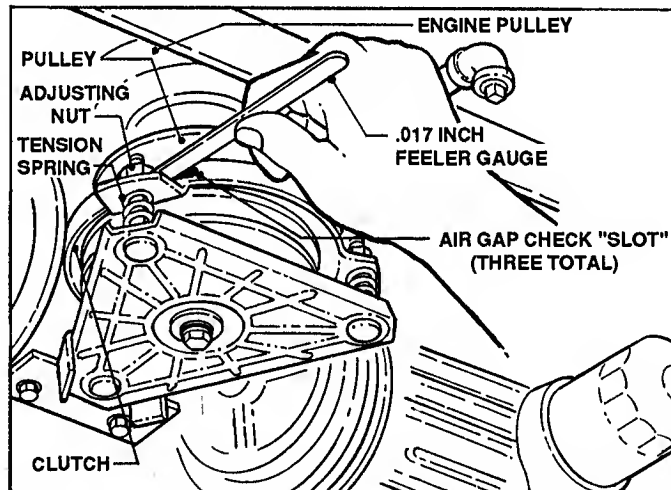


FIGURE 3.17 (USING FEELER GAUGE)

2. Insert a .017 feeler gauge into each of the 3 slots.
3. If the gaps do not fall between .010 and .025, reset the spring-loaded adjustment nuts until the gaps are measured at .017 on the feeler gauge.

THEREFORE IF...

- A. The resistance falls between 2.40 and 3.40 OHMs...
- B. The amperage draw is 3.50 AMPS to 4.5 AMPS...
- C. The air gaps are between .010" and .025" (or have been reset to .017"), the electric clutch is within factory specifications and is not the source of a problem - check the remainder of the electrical system.

Section III- ELECTRICAL SYSTEM

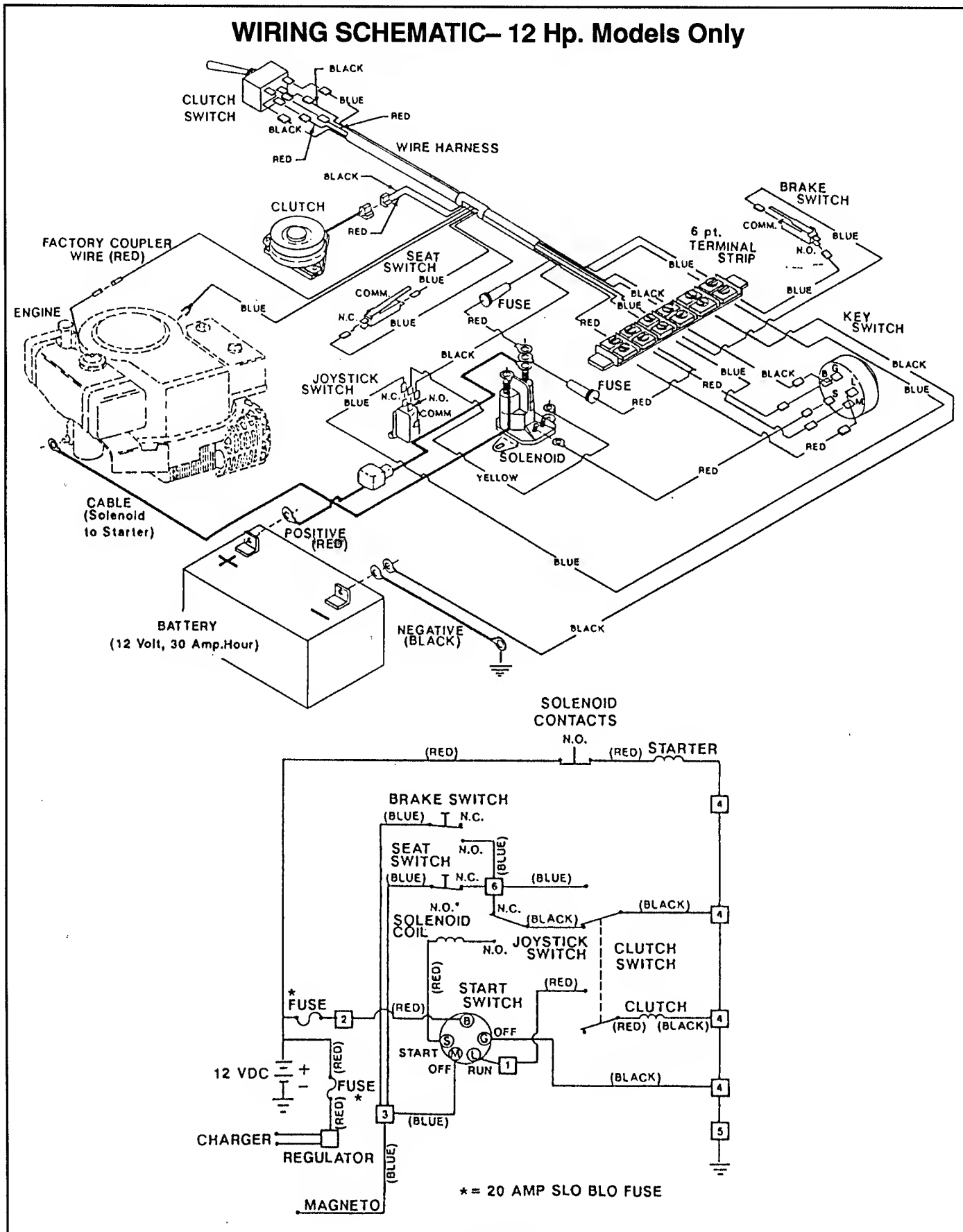


FIGURE 3.18

Section III- ELECTRICAL SYSTEM

WIRING SCHEMATIC- 14, 18 & 20 Hp. Models Only

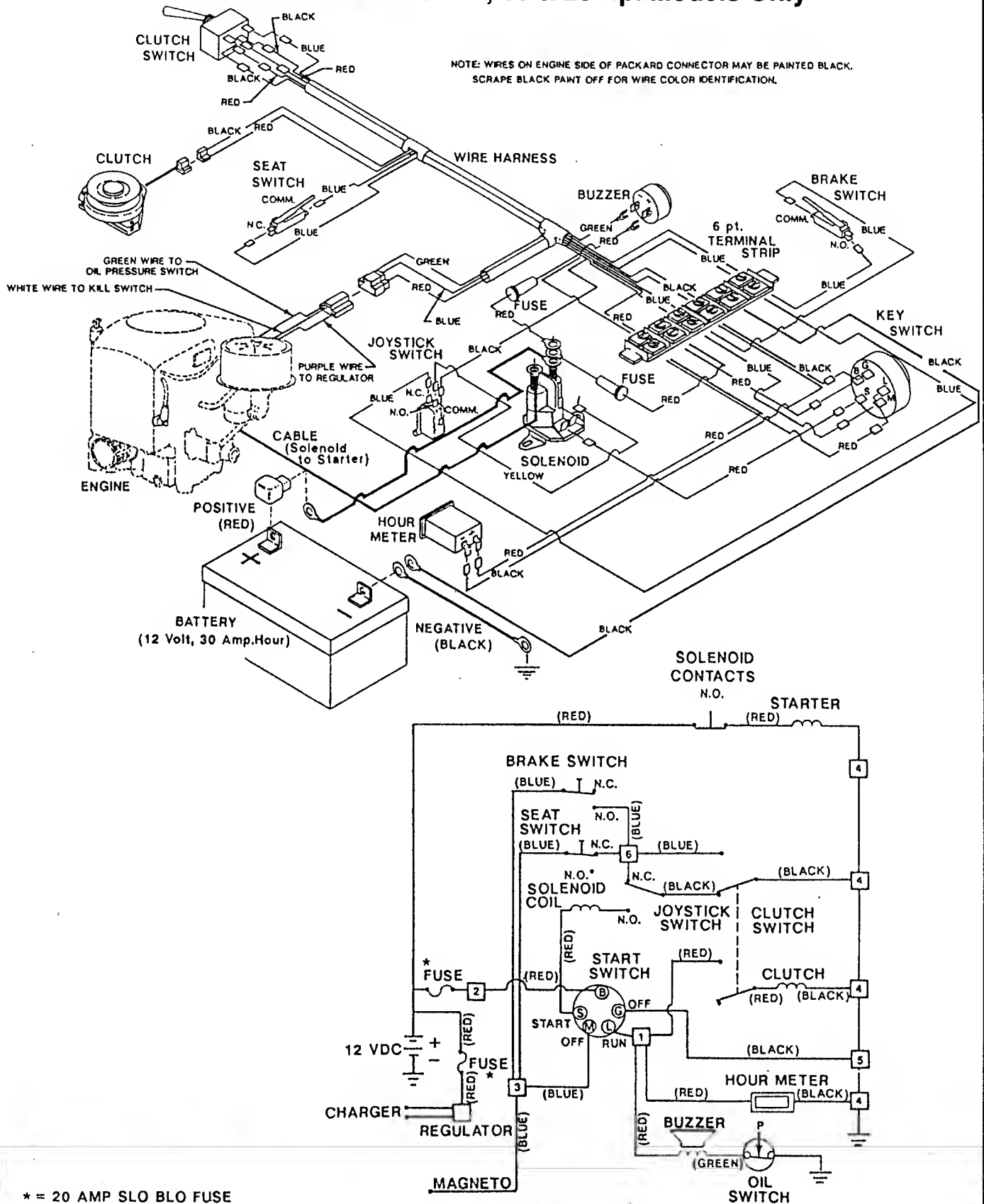


FIGURE 3.19

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This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Section IV

STEERING CONTROLS

ADJUSTMENTS & REPAIRS

Section IV - STEERING CONTROLS ADJ & REPAIRS

INTRODUCTION

This section covers procedures for the adjustment, disassembly and repair of the steering controls found on earlier and present-day (1994) SNAPPER Zero Turning Radius Mowers.

These controls include the joystick (older version), joystick (present version) and the two-handle steering systems found on earlier models of the unit.

It should be noted that most service bulletins (prior to 1994) concerning steering controls will be found incorporated in the following pages. Future service bulletins should be inserted in this section for quick reference. For component breakdowns of the different steering controls see Figures 4.1, 4.2 and 4.3.

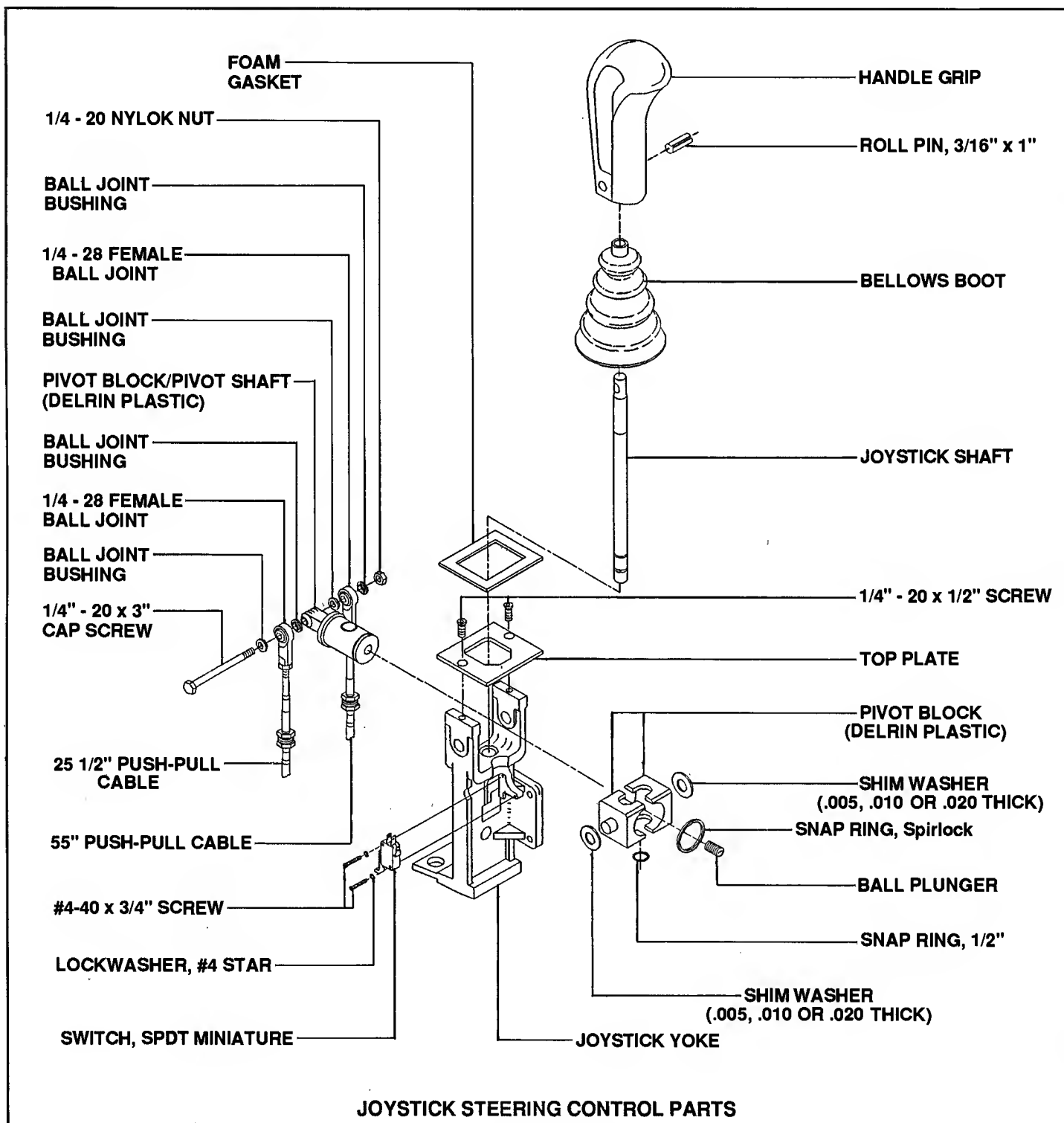


FIGURE 4.1

Section IV - STEERING CONTROLS ADJ & REPAIRS

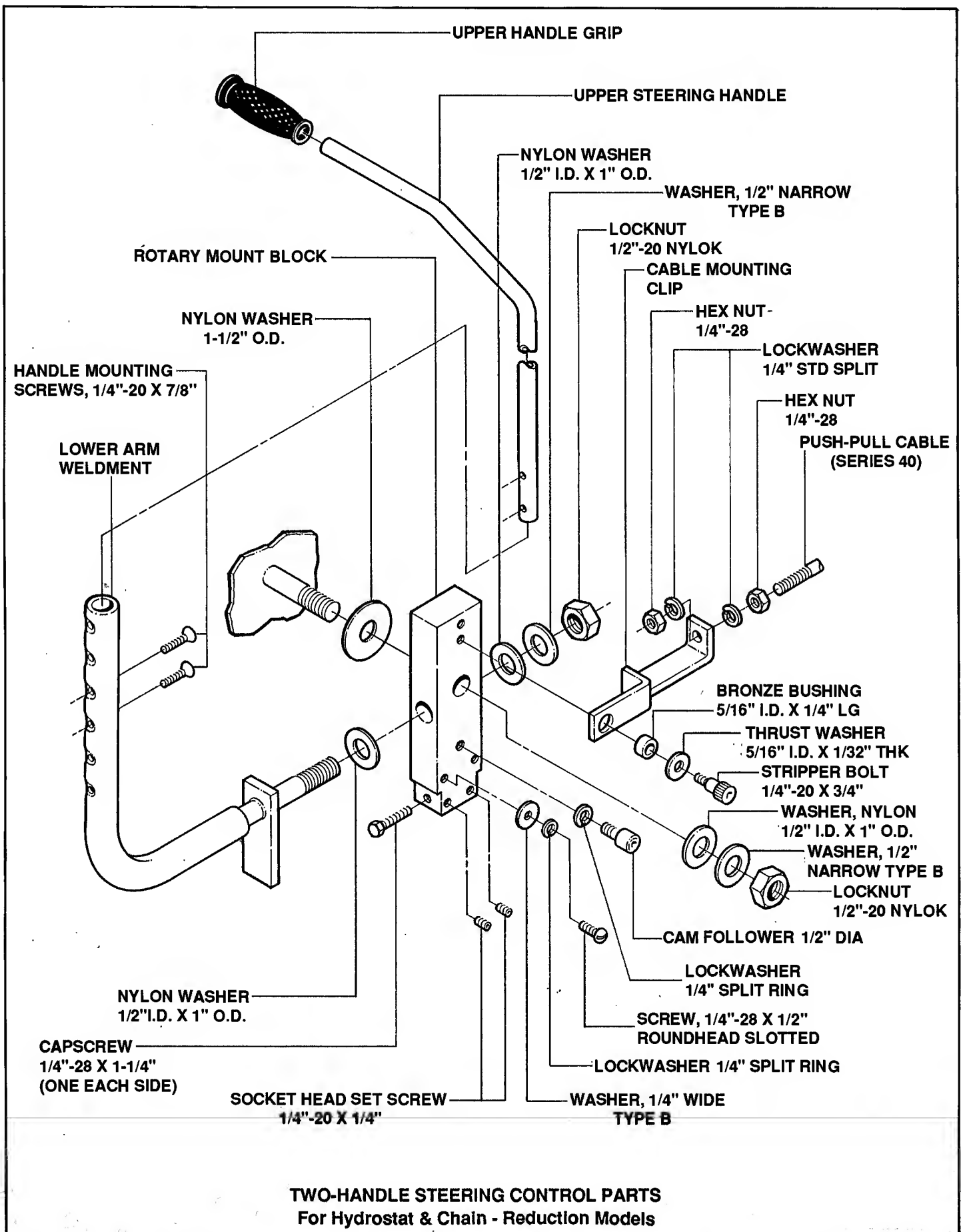
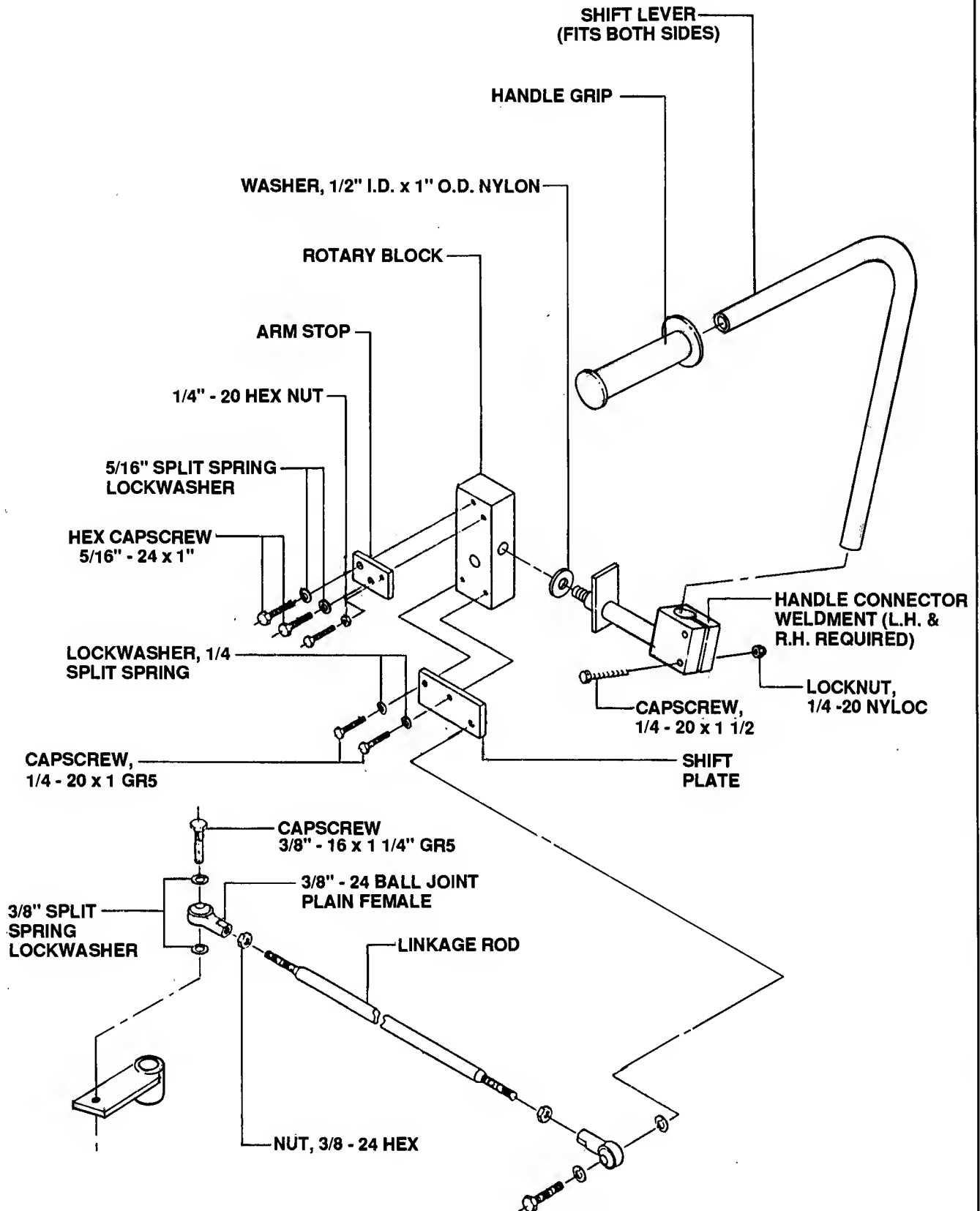


FIGURE 4.2
4.3

Section IV - STEERING CONTROLS ADJ & REPAIRS



MODEL ZU2013K

FIGURE 4.3

Section IV - STEERING CONTROLS ADJ & REPAIRS

4.1 JOYSTICK NEUTRAL ADJUSTMENT

Use the following steps to adjust "NEUTRAL" on Joystick units:

- A. Operate the unit for at least 15 minutes to warm up the hydros. Push the joystick all the way down and engage the parking brake. If the parking brake holds the unit, do not make creep adjustment. If it still creeps thru the parking brake, take the additional steps,
- B. Shut the engine "OFF".
- C. Jack rear wheels off the ground and remove both wheels.
- D. With the joystick all the way down, start the engine and observe both axles. If they rotate, remove the two bolts shown in Figure 4.4. Also, remove the heat shield. You should then be able to look directly down at the area where the control cables hook to the control arms on the pumps.

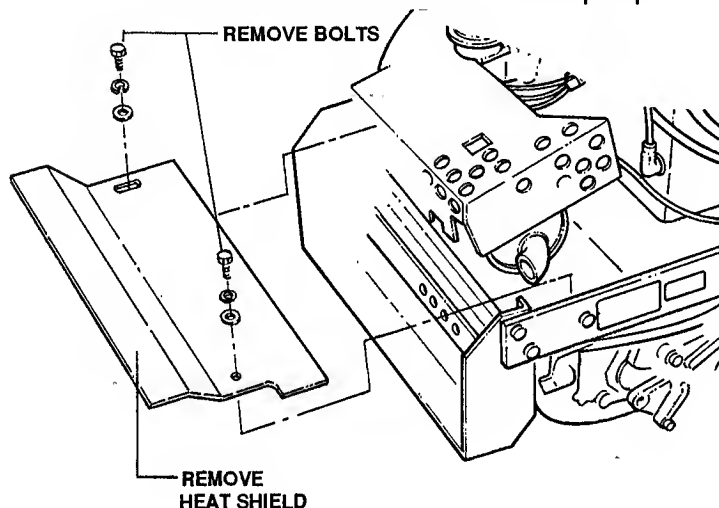


FIGURE 4.4

- E. Remove the bolt from the control arm and the control cable. See Figure 4.5. You can now move the control arms by hand. Move them until all movement ceases. Shut the engine "OFF".

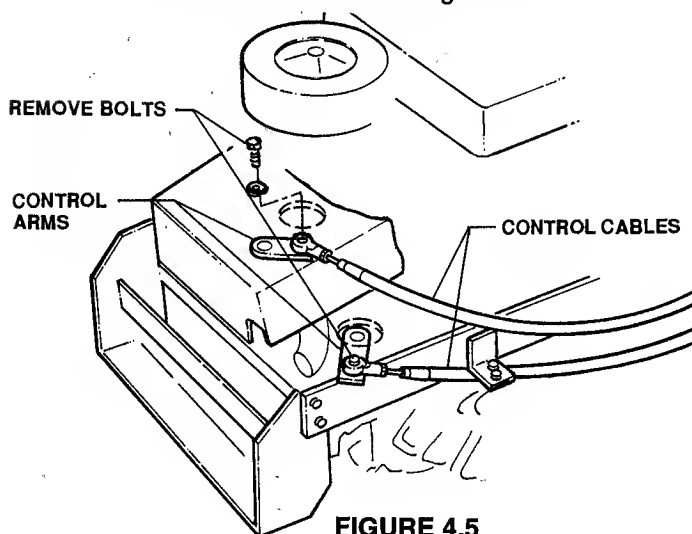


FIGURE 4.5

- F. Now, adjust the ball joints on the end of the control cables until they align with the hole in the control arm. Reinstall the bolts through the control cable into the control arm.
- G. Reinstall the wheels and perform a function check.

NOTE

It is recommended that all control cable adjustments be made at the control arms on the transmissions. Although steering cables can be adjusted at the joystick, this practice is discouraged in order to prevent the loss of parts.

4.2 DETENT ADJUSTMENT

- A. If joystick does not lock in the "UP" position, turn the detent adjustment screw clockwise until a desirable locking action is obtained. See Figure 4.6.

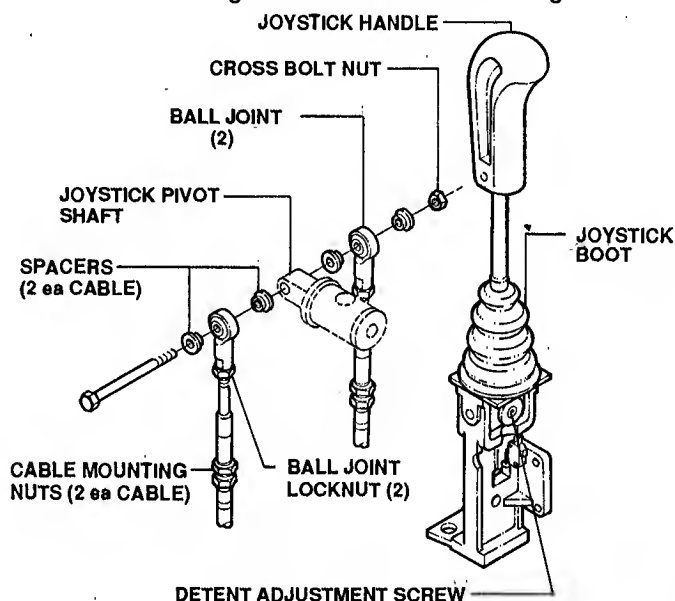


FIGURE 4.6

- B. If joystick is hard to slide up and down, turn the detent adjustment screw counterclockwise until a desirable sliding action is obtained.

4.3 JOYSTICK LUBRICATION

(Z Models With Metal Pivot Block)

- A. Place a few drops of Teflon™ spray lubricant on joystick shaft where it enters the pivot block, then work joystick up and down and rotate it to distribute oil around the joystick shaft and into the pivot block.
- B. Pull up on joystick to lock it in the "UP" position. If joystick will not lock in the "UP" position, adjust the detent screw per instructions in 4.2, DETENT ADJUSTMENT.

4.4 JOYSTICK SENSITIVITY ADJUSTMENT

To quicken sideways turning response, adjust as follows:

- A. Remove right hand fender skirt to expose joystick assembly.

SECTION IV - STEERING CONTROLS ADJ & REPAIRS

- B. Remove lock nut, cross bolt and spacers. See Figure 4.7.

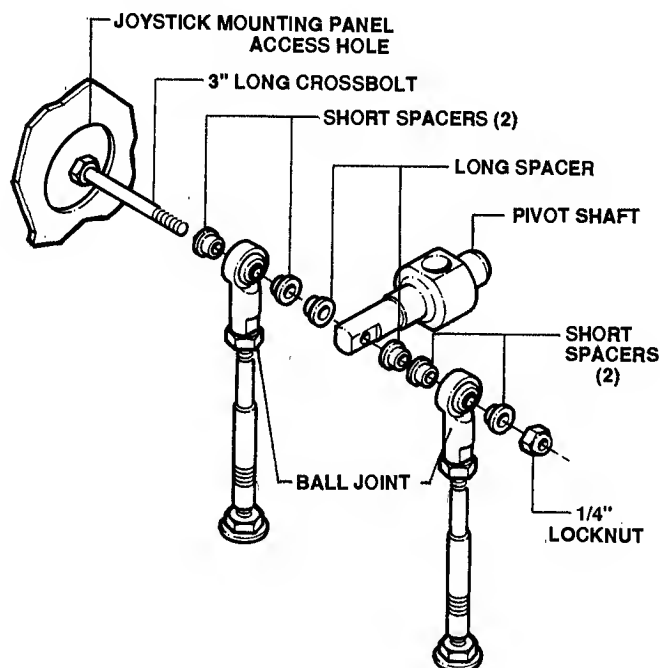


FIGURE 4.7

- C. Reassemble spacers as desired. More spacers between the ball joint and joystick pivot shaft quicken the response, less slows the response.

NOTE

It is important that there is a spacer on each side of the turnbuckles to prevent damage to the ball joints or cables.

4.5 JOYSTICK SENSITIVITY ENHANCEMENT PROCEDURE

For even quicker response side-to-side, the control cables need to be spread apart at the pivot shaft. Proceed as follows:

Additional parts required: 1/4" washers (6 max.)
1/4 - 20 x 3" long bolt

- Remove the right hand fender skirt to access the joystick components.
- Remove the crossbolt that holds the cable ball joints and bushings to the pivot shaft. Make sure not to lose the bushings.
- Install the desired amount of washers on each side of the pivot shaft to spread the cable ends apart. Use no more than 3 washers per side. Excess washers will bend the cables and cause them to break. The 3" long bolt should be installed with the head on the inside (closest to the seat) to prevent it from hitting the joystick mounting panel. See Figure 4.8.

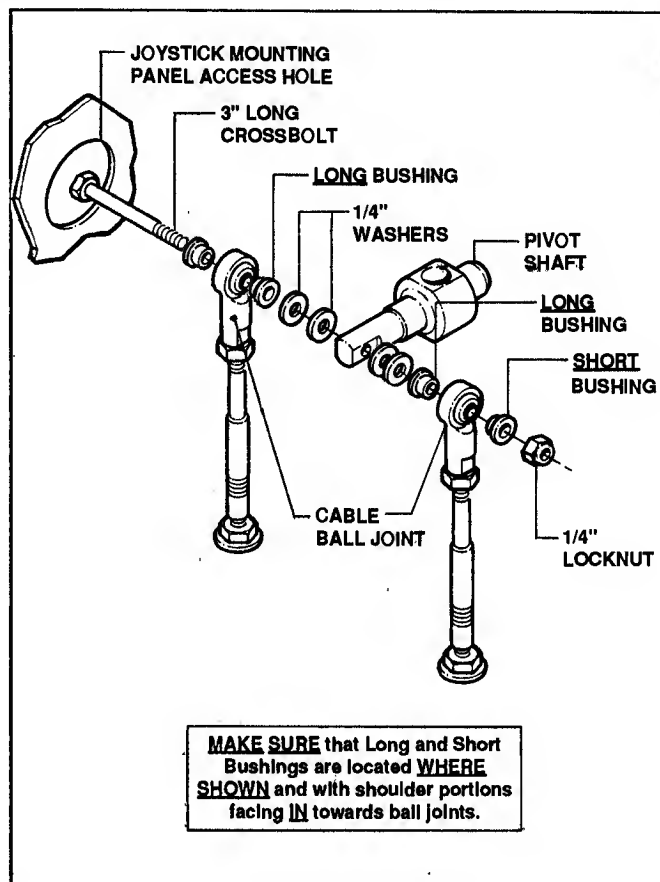


FIGURE 4.8

- D. Make sure the bushings are in the same order as before. Refer to Figure 4.8. There is a difference in the bushings. After all parts are assembled and tight, rotate the joystick, making sure it moves freely without striking anything or pinching wires, etc.

NOTE

First try 1 washer per side, and, if the response is not quick enough, keep adding washers until a desired response is achieved - no more than 3 per side.

4.6 STEERING LEVEL ADJUSTMENT (Models 2-LEVER & ZU-RIDERS)

With the engine running, if the machine travels forward or rearward when the steering levers are in the neutral position, stop the engine and adjust as follows:

A. LEFT WHEEL ADJUSTMENT

- Tilt the seat forward to gain access to the rotary mount blocks.
- If control lever does not rotate freely into neutral slot without applying forward or back pressure on the handles, adjust as follows:
 - Remove the control linkage bolt from the rotary mount. See Figure 4.9.

Section IV - STEERING CONTROLS ADJ & REPAIR

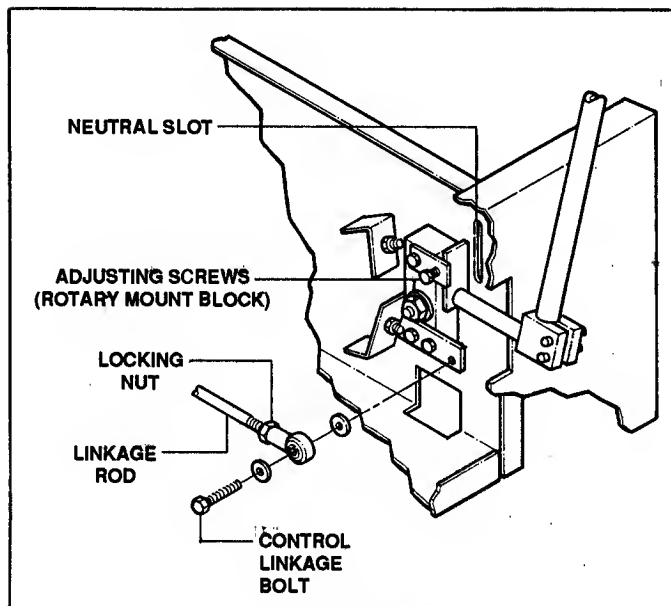


FIGURE 4.9

(b) Loosen the locking nut and adjust the linkage to find neutral.

4.7 SHIFT BLOCK LINKAGE ADJUSTMENT

If steering control adjustments cannot be completed at the joystick or steering lever sections, then adjust the shift block end of the controls as follows:

A. ADJUSTING SHIFTING BLOCK

1. Remove capscrew from end of ball joint. See Figure 4.10.

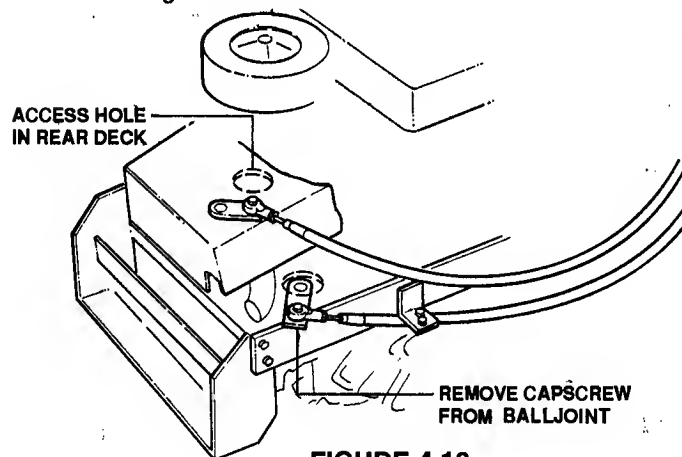


FIGURE 4.10

2. Screw ball joint IN or OUT to adjust shift block to desired position.
3. Reattach ball joint end to shift block and test adjustment.
4. Repeat procedure as required until steering is adjusted to satisfaction.

B. MAJOR ADJUSTMENT TO SHIFT BLOCKS

If the drive unit cannot be adjusted to perform as desired from either the joystick end or shift block end, then the shift block may be installed in the wrong hole and movement of the shift block on the shaft may be required. Proceed as follows:

1. Remove capscrew and ball joint from shift block.
2. Drive out roll pin. See Figure 4.11.

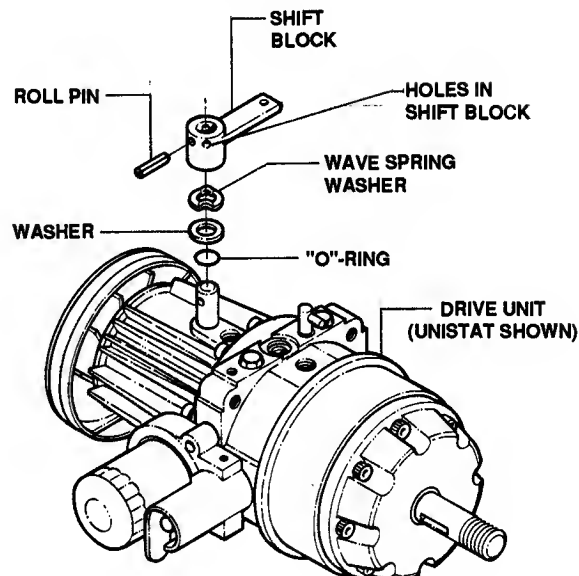


FIGURE 4.11

3. Rotate shift block to next hole.
4. Reinstall roll pin.
5. Reattach ball joint.
6. Adjust ball joints at both ends to optimum setting. Test unit for performance.

4.8 NEUTRAL RETURN ADJUSTMENT

2-LEVER MODELS

A. Should either of the steering controls fail to return to neutral upon release, then the neutral return assembly should be checked/adjusted as follows:

1. Loosen fender cap, then remove fender assembly from that side of the unit being checked. See Figure 4.12.
2. Jack up rear of unit and support with jackstands.
3. Start engine. The wheel on the side needing adjusting will begin to rotate.
4. Visually check the neutral return assembly for broken or worn parts (i.e., extension spring; eccentric cam (loose); cam follower (loose/worn); etc.

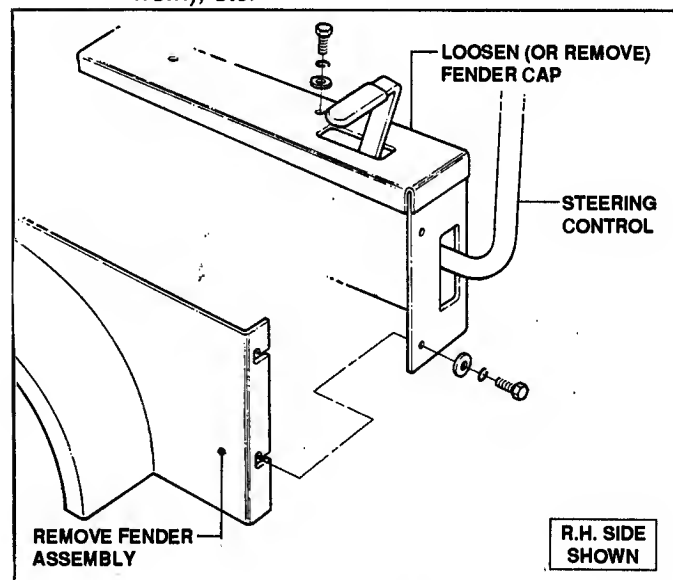


FIGURE 4.12

Section IV - STEERING CONTROLS ADJ & REPAIR

(a) Extension Spring

If unhooked, reattach. If missing or broken, replace.

(b) Eccentric Centering Cam

Check for tightness. Also, check adjustment - this is the most likely cause for failure to return to neutral. To adjust, loosen cam set screw and rotate eccentric centering cam until rotary mount block returns system to neutral. Retighten cam set screw. See Figure 4.13.

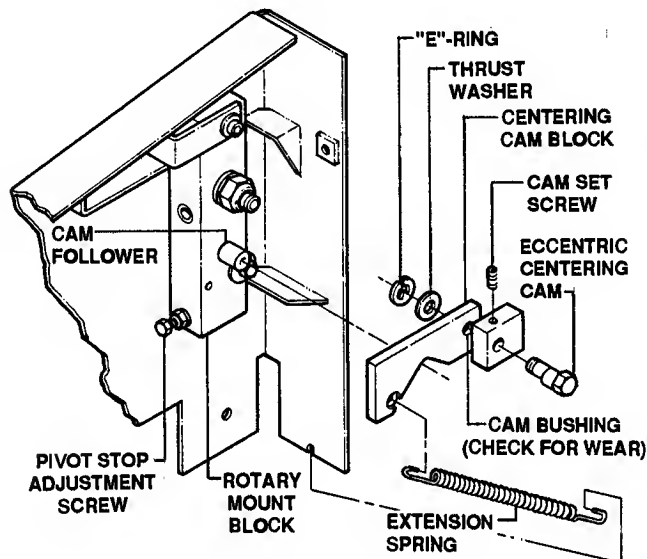


FIGURE 4.13

(c) Cam Follower

Check for tightness and wear. If worn, replace with new part.

(d) Push/Pull Cable

If any of the preceding parts do not require replacement/adjustment, then check the push/pull cable.

- Loosen locking nuts at steering control end of cable.
- Adjust cable in or out as required until wheel ceases to rotate and neutral is achieved. See Figure 4.14.

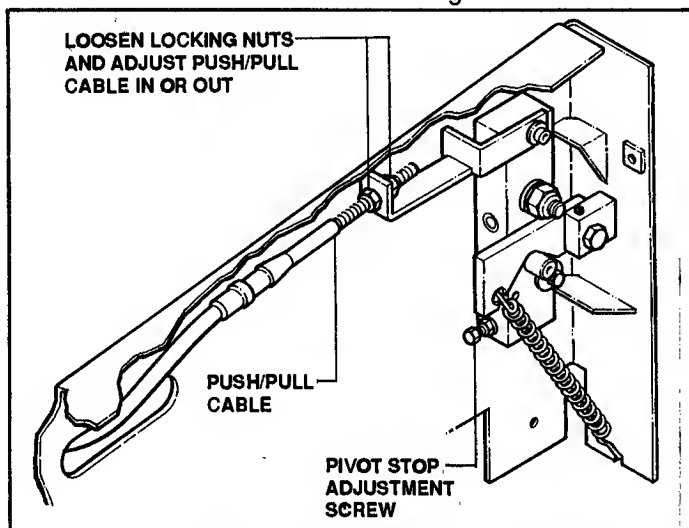


FIGURE 4.14

B. The pivot stop adjustment screws are set to limit the forward and rearward movement of the rotary mount block (and steering handles). These stop screws, on rare occasion, could cause the steering controls to fail to return to neutral upon release. If no other adjustment solves the problem, adjust the stops as follows:

1. With unit elevated at the rear and the engine running and a wheel is still rotating, check each pivot stop screw for setting.
2. If a pivot stop screw is touching its respective stop, loosen the lock nut and adjust the screw IN until rotary mount block moves to put drive in neutral. Refer to Figure 4.14.

4.9 JOYSTICK PIVOT ASSEMBLY REPLACEMENT PROCEDURE

A. Removing the Current Pivot Block and Pivot Shaft. See Figure 4.15.

1. With the joystick in the "UP" position, remove the roll pin from the joystick handle and the joystick handle from the joystick shaft. Hold a block of wood on the opposite side you are driving the roll pin out of, to prevent damage to the joystick parts.
2. Remove the fender skirt. Remove the bolts from the fender cap and push it out of the way. Make sure not to pull any wires loose during this process.
3. Remove the bolt from the back of the pivot shaft holding the ball joints in place. Discard the long bushings and keep the short bushings.
4. Slide the joystick boot off the joystick shaft. Remove the top plate from the yoke (locate the screw heads and cut the foam pad around them). There is a set screw in each of the threaded holes. Remove them and discard. This allows the trunnion pins holding the pivot block in place to be removed and discarded. In order to get the trunnion pins out, screw a 1/4-20 bolt into the pin and pull the pin out. Do this for both sides.
5. Remove and discard the old pivot block. Once removed, slide the joystick shaft out through the bottom, keeping the snap ring in place. See Figure 4.15.

Section IV - STEERING CONTROLS ADJ & REPAIRS

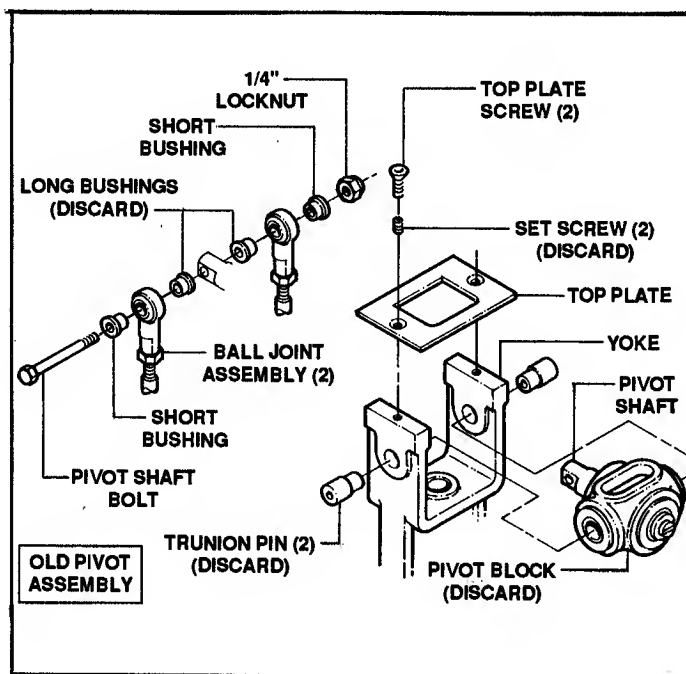


FIGURE 4.15

B. Installation of New Pivot Block and Pivot Shaft See Figure 4.16.

1. Rotate the two halves of the pivot block so that the projections are side by side and place them into the yoke. The studs on the back of each half go into the holes that the trunnion pins were in. The trunnion pins are no longer required. Rotate the halves to form a circle in the center cut-outs on the pivot blocks.
2. Test fit the pivot shaft into the pivot block assembly. If the pivot shaft is loose, remove it and the pivot blocks, place proper thickness of shims on the studs of the pivot blocks. Repeat the test fitting of this assembly until the pivot shaft and pivot blocks rotate freely and without any excessive play. If the pivot shaft does not turn freely without any shims installed, it may be necessary to deburr the inside of the trunnion pin holes. Place the large snap-ring on the front of the pivot shaft to retain it in place.

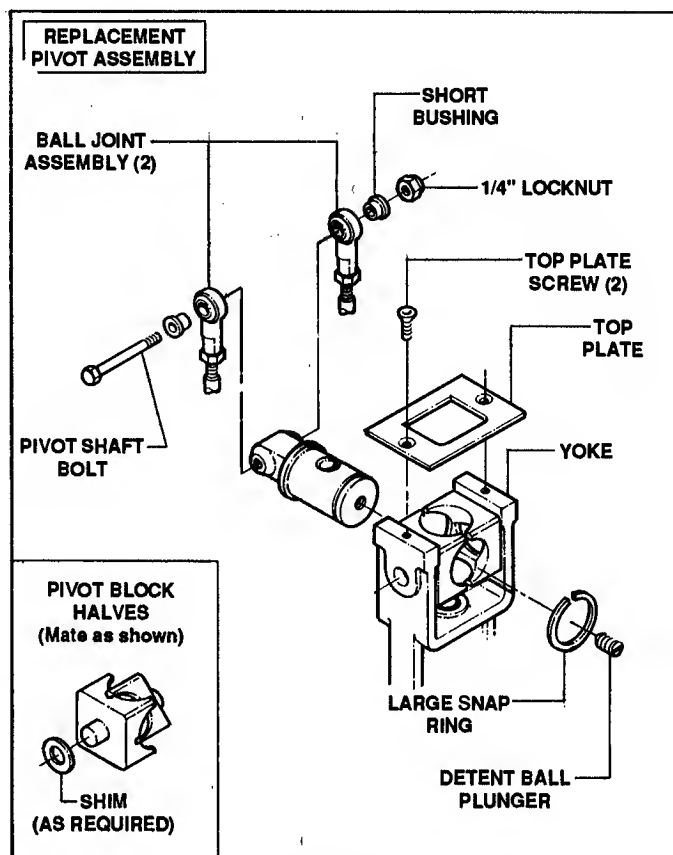


FIGURE 4.16

3. Inspect to see that the snap -ring on the joystick shaft is intact. Replace if necessary. Rotate the pivot shaft assembly and insert the joystick shaft with the snap-ring at bottom.
4. Replace the top plate. DO NOT use the trunnion pin set screws.
5. Reassemble the ball joints to the pivot shaft. DO NOT use the two long bushings from the previous assembly.
6. Insert the detent ball plunger into the front of the pivot shaft. This locks the joystick shaft in the "UP" position. Adjust as desired to obtain the proper locking action.
7. Replace the joystick boot. Replace the fender cap.
8. With the joystick in the "UP" position, replace the joystick handle. Hold a block of wood on the opposite side you are driving the roll pin into. This prevents damage to the joystick parts.
9. Start the mower to check for creeping (neutral positioning). If the mower creeps forward or reverse, adjust for neutral. Replace the fender skirt.

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Section V

WHEEL and TIRE

REPAIR/REPLACEMENT

Section V - WHEEL AND TIRE REPAIR/REPLACEMENT

INTRODUCTION

The Models Z & ZU units use tubeless tires on both front and rear. Should rim leakage occur, and cannot be solved by dressing the rim, it is recommended that an inner tube be installed in lieu of replacing the wheel and tire assembly. Tubes should be sized to fit. If a wheel and tire assembly is replaced, use only the newer DICO™ tire and wheel assemblies as found in the current (1994) parts books; these are a softer, self-cleaning tire and will improve performance. Do not use ATV tires on the unit! They are much too aggressive and will cause damage to most lawns!

5.1 FRONT WHEEL REMOVAL

- A. Raise front end of unit and support with jackstands.
- B. Remove nut and bolt as shown in Figure 5.1.

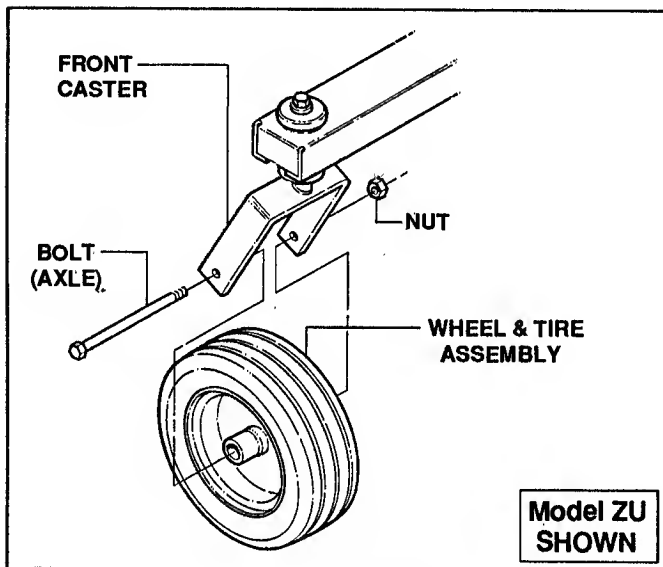


FIGURE 5.1

- C. Repair or replace tire (or) wheel and tire assembly.
- D. Inspect wheel bearing and axle components for signs of wear, breakage, etc. Repair or replace as required. See Figure 5.2.

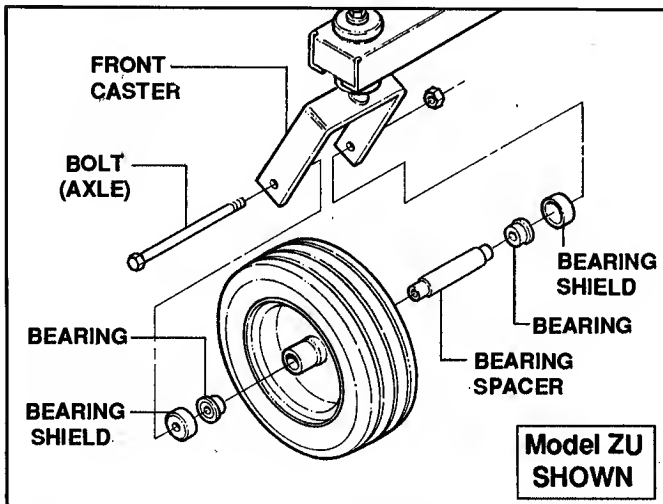


FIGURE 5.2

NOTE

The front casters and wheel assemblies use sealed bearings and do not require lubrication. A light coating of 30W motor oil to prevent rust and to facilitate assembly is all that is required.

- E. Reinstall wheel bearings and tire assembly in reverse order.

5.2 REAR WHEEL REMOVAL

(Without removing hub - UNISTAT Models with 23" TIRES)

- A. Raise rear end of unit and support with jackstands.
- B. To remove wheel and tire assembly only, loosen, then remove the five 7/16" lug nuts. See Figure 5.3.

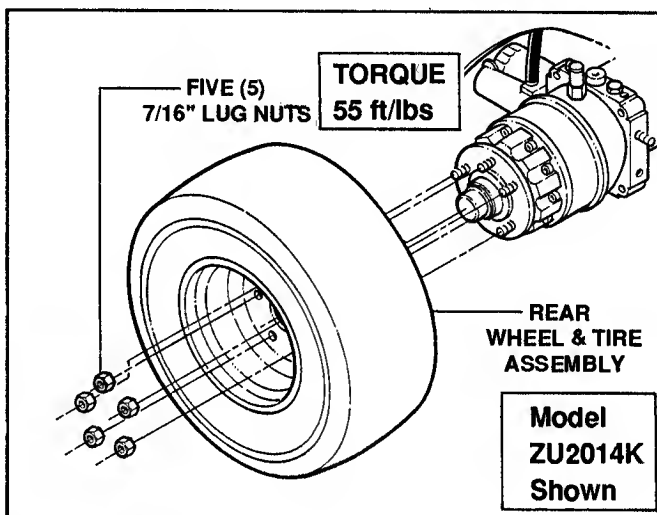


FIGURE 5.3

NOTE

Models 1810, 2010 & ZU2013K have four (4) 1/2"-20 x 60 degree lug nuts each. They should be torqued to 85 ft/lbs.

- C. Repair or replace tire (or) wheel and tire assembly.
- D. Reinstall tire assembly in reverse order.

5.3 REAR WHEEL & HUB REMOVAL

(Hub removal - UNISTAT Models)

- A. Raise rear end of unit and support with jackstands. Remove wheels.
- B. Remove grease cap.
- C. Remove 1" - 14 NF PLATED hex nut.
- D. Remove 1" SPLIT GALV. lockwasher.
- E. Remove hub from UNISTAT drive shaft (a heavy-duty gear - puller is required). Be careful not to lose woodruff key!
- F. Repair or replace tire (or) wheel and tire assembly.
- G. Reinstall tire assembly in reverse order.

Section V - WHEEL AND TIRE REPAIR/REPLACEMENT

5.4 REAR WHEEL REMOVAL

(Without removing hub - HYDROSTAT Models)

- A. Raise rear end of unit and support with jackstands.
- B. To remove wheel and tire assembly only, loosen then remove the four 1/2" lug nuts. See Figure 5.4.

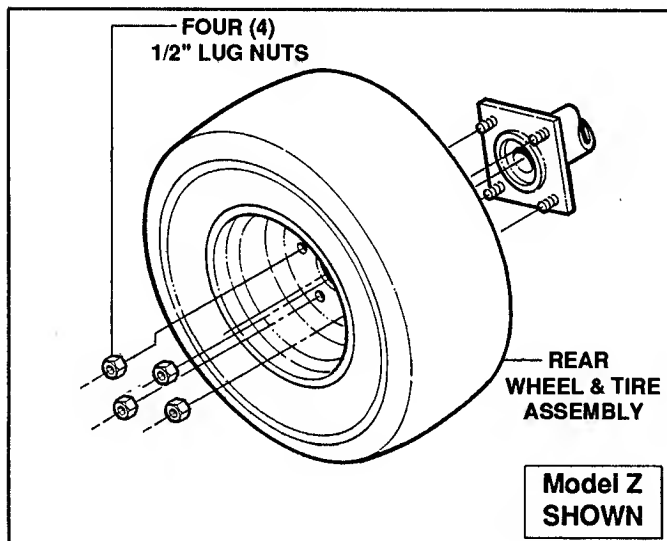


FIGURE 5.4

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Section VI

BUMPER/AXLE & CASTER WHEEL REPAIR

Section VI - FRONT BUMPER/AXLE & CASTER WHEEL REPAIR

INTRODUCTION

This section covers procedures for the removal and replacement of those front bumper/axle and caster wheel components used on the Z & ZU Series Zero Turning Radius Riding Mowers.

These components include the front bumper/axle assemblies, caster assemblies and front wheel assemblies. See Figure 6.1.

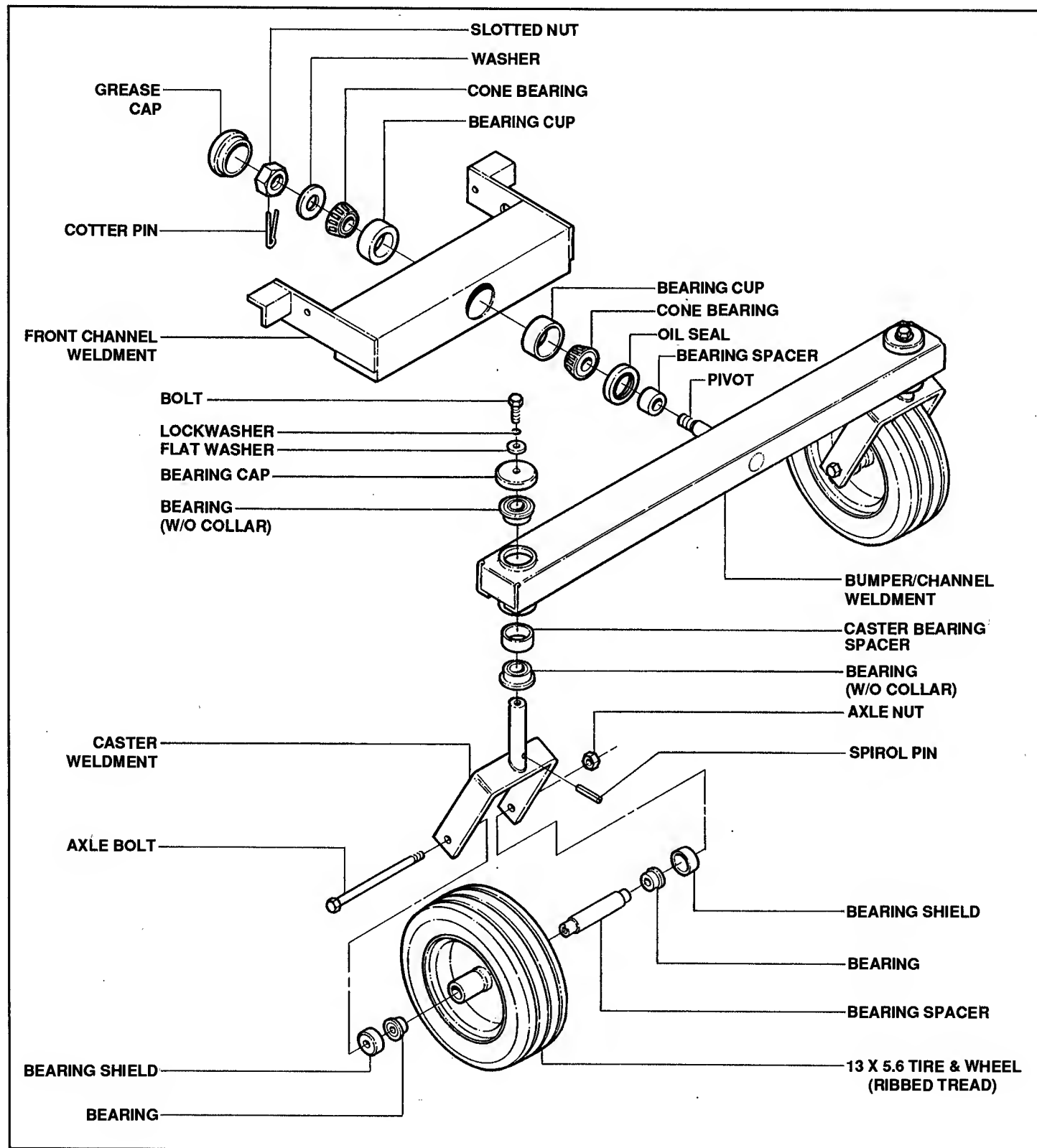


FIGURE 6.1
6.2

Section VI - FRONT BUMPER/AXLE & CASTER WHEEL REPAIR

6.1 FRONT BUMPER/AXLE PIVOT BEARING REPLACEMENT

- A. Raise front end of unit and support side rails with jackstands.

NOTE

Removal of the front caster wheel assemblies will make the front bumper/axle more manageable during removal. Refer to Figure 6.3.

- B. Remove front caster wheels (See NOTE above).
C. Pry off grease cap then remove cotter pin and slotted nut (These are located behind the front channel weldment. Refer to Figure 6.2.

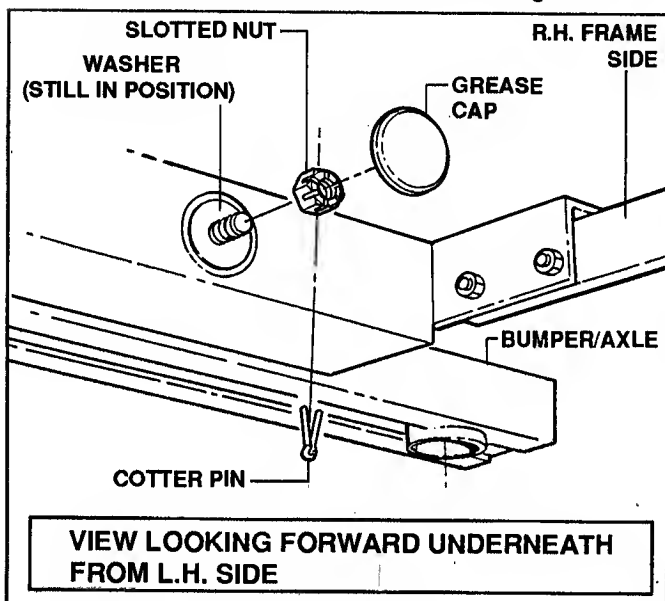


FIGURE 6.2

- D. Grip front bumper/axle firmly and pull forward to remove it from the front channel weldment.
E. Remove bearing components from axle pivot shaft and front channel weldment. Refer to Figure 6.1.
F. Replace bearings and oil seal with new parts. Inspect spacer, bearing cups, washer, etc. for signs of wear. Replace as required.
G. Lubricate all parts, then reassemble in reverse order.

6.2 CASTER BEARING REPLACEMENT

- A. Raise front end of unit high enough to allow caster removal. Support side rails with jackstands.
B. Remove 1/4" - 20 x 5/8" bolt, 1/4" lockwasher and flat washer.
C. Lift off bearing cap.
D. Using a soft-metal mallet, tap the top of the caster shaft until it can be pulled out from the bottom of the bumper/axle.
E. Inspect bearings, spacer, etc. for wear. Replace parts as required. See Figure 6.3.

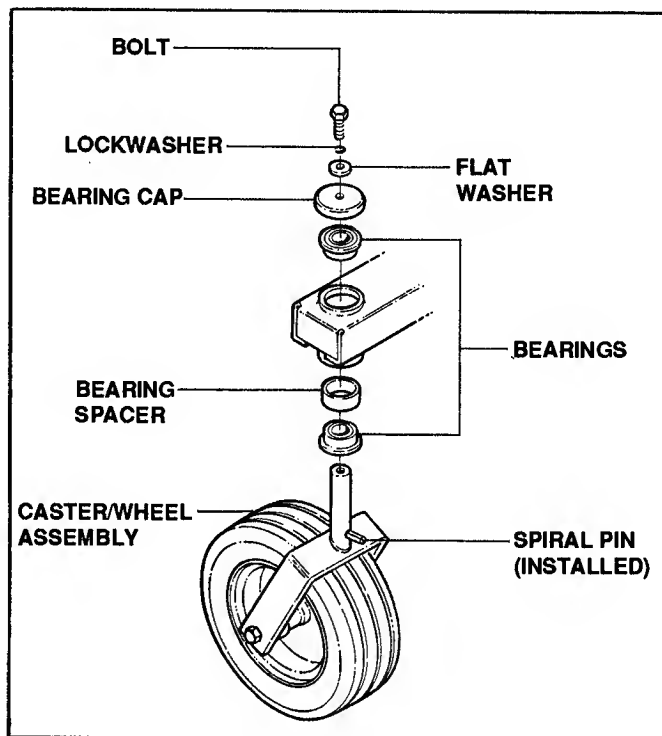


FIGURE 6.3

6.3 FRONT CASTER WHEEL BEARING REPLACEMENT

- A. Raise front of unit and support with jackstands.
B. Remove axle nut and bolt from caster wheel.
C. Remove bearing shields, bearings and bearing spacer from caster wheel assembly. See Figure 6.4.

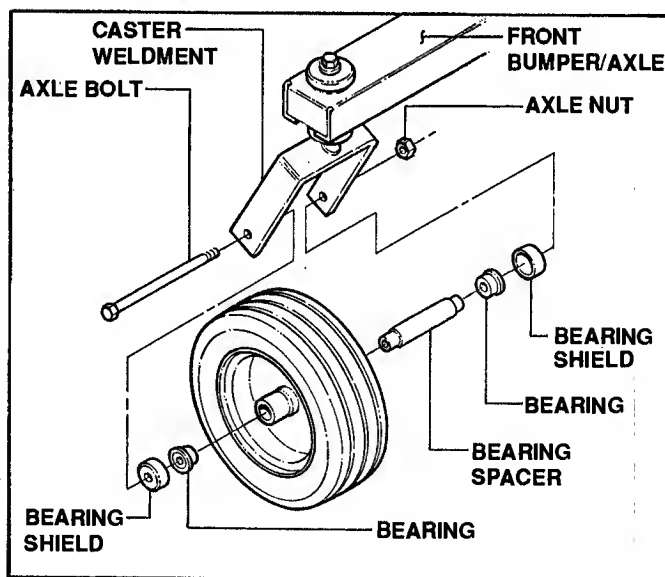


FIGURE 6.4

- D. Clean and inspect bearing bore of caster wheel.
E. Clean and grease bearing spacer.
F. Install bearing spacer and new bearings in caster wheel.
G. Reinstall caster wheel assembly in reverse order.

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Section VII

ENGINE

Section VII - ENGINE

INTRODUCTION

This section covers procedures for the maintenance and disassembly of those engine components which power the different units.

These components include the engine, transmission (Unistat; Hydrostat), idler pulleys and belts.

7.1 ENGINE MAINTENANCE

(The following information is applicable to most engines; regardless of make, model or horsepower).

A. ENGINE OIL

1. Change engine oil on a regular schedule. Use only those oils classified for Service SF, SE, SD or SC (These oils will keep the engine cleaner and will help retard the formation of gum and varnish deposits). **DO NOT** use oil additives!
2. Refer to the following chart for recommended grades to use with temperature range anticipated before next oil change.

RECOMMENDED SAE VISCOSITY GRADES

* If not available, a synthetic oil may be used having 5W-20 or 5W-30 viscosity.

B. SPARK PLUGS

1. Spark plugs should be cleaned or replaced (if necessary) and gap reset to .030 or .035 every 100 hours of operation or every 6 months, whichever comes first.
2. To clean, remove spark plug from engine, scrape or wire brush and wash with a commercial solvent. **DO NOT** blast clean.

NOTE

Sparking can occur if wire terminal does not fit firmly on spark plug. Compress terminals if necessary.

C. MUFFLER

1. When servicing engine, inspect muffler for signs of damage or deterioration. Replace as required.
2. Make sure that muffler guard (if applicable) is always in place and secure before allowing mower to leave the shop.

CAUTION

Worn out mufflers are more than just a noise nuisance and should be replaced immediately. Continued use could result in fire or explosion!

D. AIR CLEANER

(Consult Engine Manual for part number of filter element).

1. Inspect filter during every engine service or every 25 operating hours (More often if mower is used under extremely dirty or dusty conditions). See Figure 7.1.

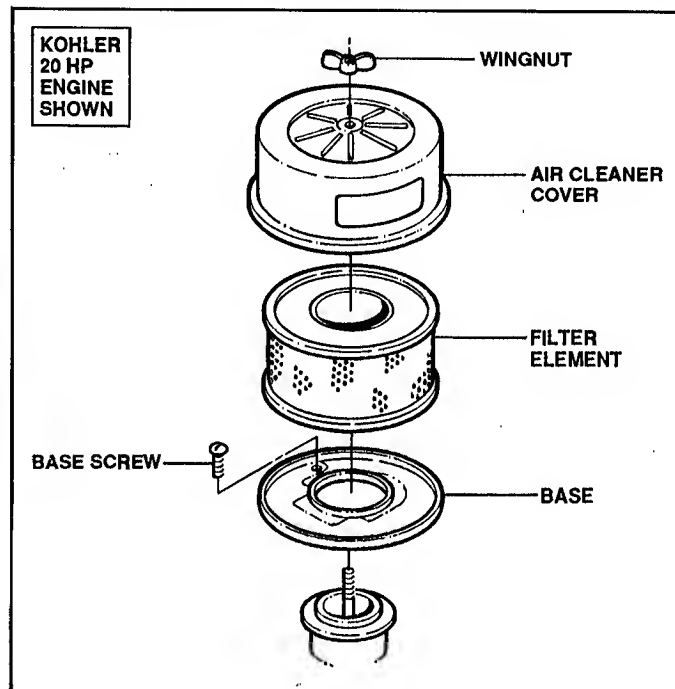


FIGURE 7.1

2. Replace filter as required.
3. Always clean cover inside and out, and clean base before reassembly.

E. FUEL FILTER

WARNING!

Gasoline is flammable and must be handled with care. DO NOT allow open flame, matches or smoking in area. Wipe up any spills. Use approved (RED) fuel container.

Shown in Figures 7.2 & 7.3 are the two types of fuel filters found on most units.

1. Check the In-Line Fuel Filter at frequent intervals and replace before the screen become clogged with sediment. Make sure the replacement is correctly installed with the arrow on filter pointing toward the engine. Check the Fuel System Components frequently and replace any parts showing worn spots or cracks. See Figure 7.2.

Section VII - ENGINE

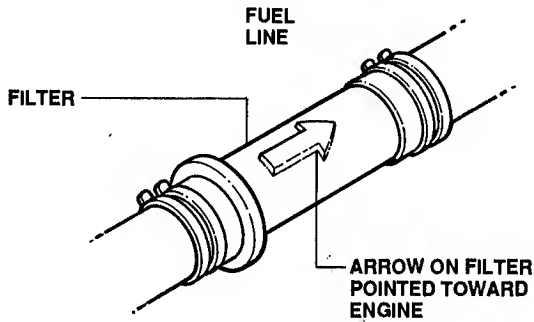


FIGURE 7.2

2. Make sure the replacement filter is correctly installed with "IN" marking toward the fuel tank and "OUT" toward the engine. Replace any parts which appear worn. See Figure 7.3.

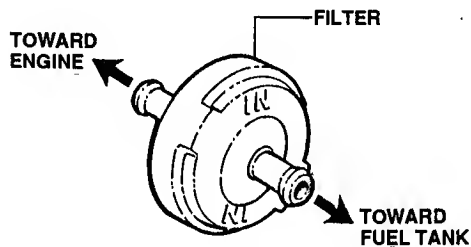


FIGURE 7.3

7.2 ENGINE REMOVAL & INSTALLATION

The following procedures are for the removal and reinstallation of the unit's engine. Refer to the engine manufacturer's service/repair manual for information concerning engine repairs.

A. ENGINE REMOVAL (KOHLER)

1. Tilt operator's seat forward and disconnect the battery's negative (black wire) terminal.
2. Slide protective boot aside and disconnect the battery's positive (red wire) terminal. See Figure 7.4.

WARNING!

ALWAYS disconnect negative (black wire) FIRST! ALWAYS connect the negative wire LAST!

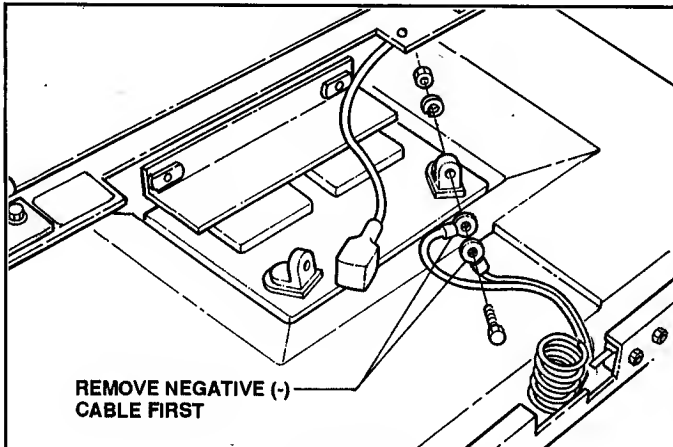


FIGURE 7.4

3. Roll the deck drive belt off the center deck pulley, then pull the belt slack up to the engine clutch pulley and remove the belt.
4. Remove the air breather cover and filter element, then remove mounting screw and filter base. See Figure 7.5.

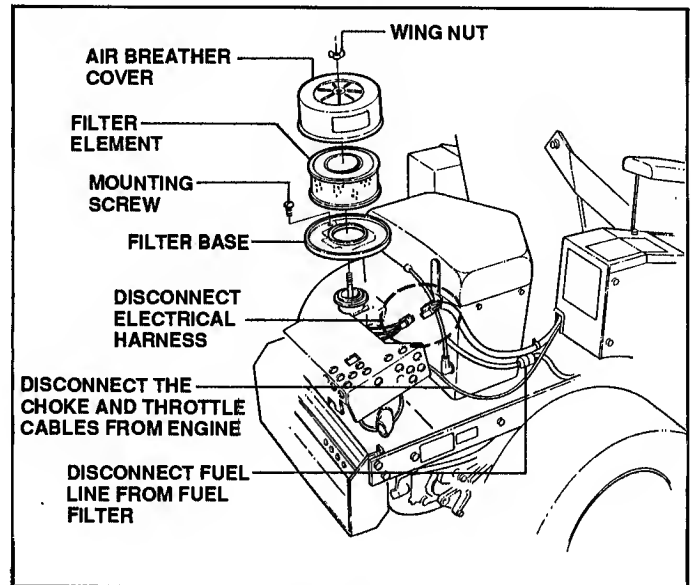


FIGURE 7.5

5. Separate the connectors of the engine and tractor's electrical wiring harness (See Figure 7.5).
6. Disconnect the choke and throttle cables from the engine.
7. Remove the fuel line at the fuel filter.
8. Disconnect the red (positive) cable from the base of the starter. See Figure 7.6.

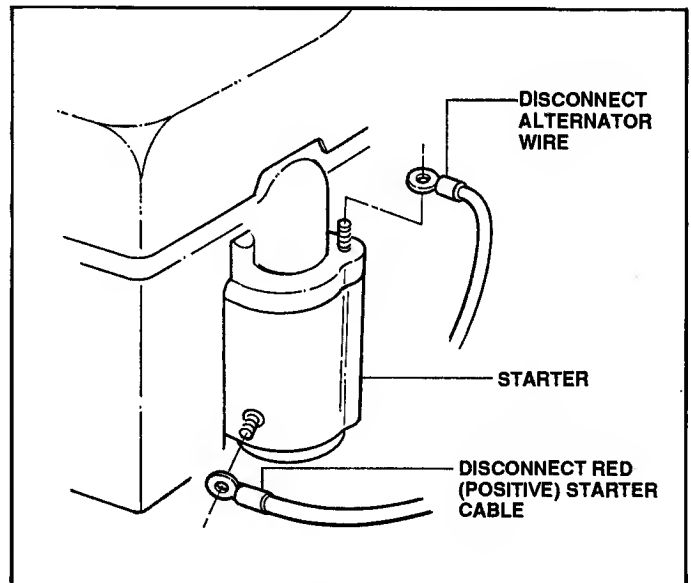


FIGURE 7.6

9. Disconnect alternator wire from starter.
10. Remove the engine mounting bolts from the motor mount plate. See Figure 7.7.

Section VII - ENGINE

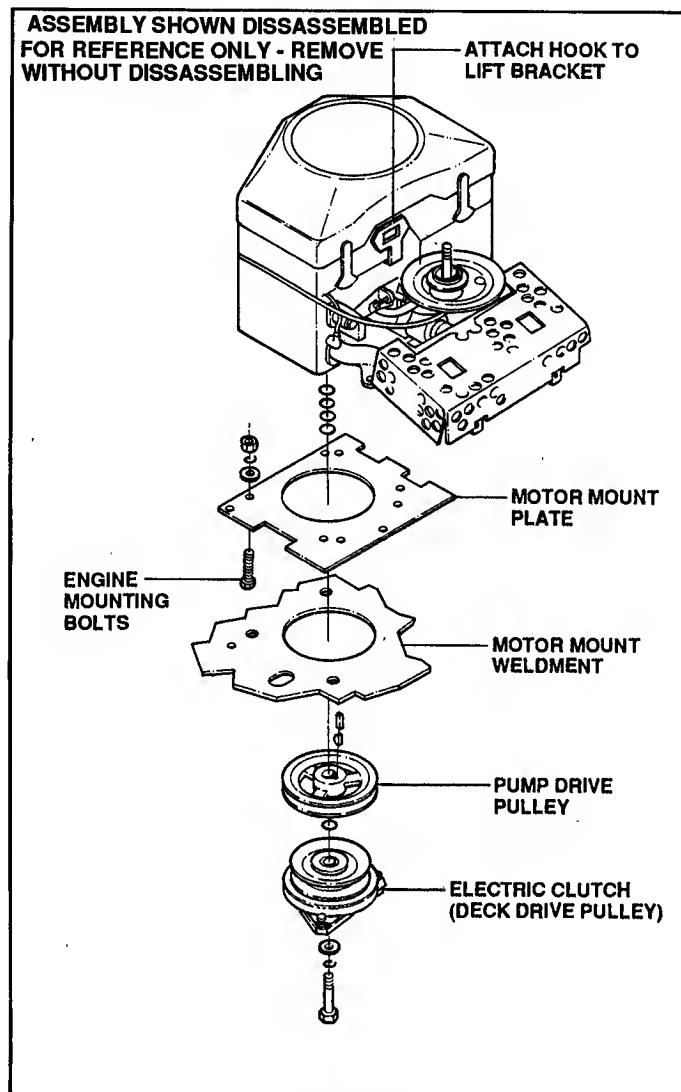


FIGURE 7.7

11. Attach hook to engine lift bracket and remove engine.

B. ENGINE INSTALLATION

Reverse removal procedure to reinstall engine.

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This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Section VIII

TRANSMISSION & DRIVE

SYSTEM

Section VIII - TRANSMISSION & DRIVE SYSTEM

8.1 TRANSMISSIONS

At the time of this writing, the only transmissions covered in this section are the Unistat and Hydrostat Transmissions. For information on other transmissions (or drive units) contact SNAPPER Customer Service.

A. UNISTAT TRANSMISSION

The Unistat is a self-contained drive unit. All the components required for operation (hydraulic motor, filter, valves, gearing, etc.) are packaged into one assembly. Some points about the Unistat are as follows:

1. Unistats are *self-purging*. They are equipped with a built-in gyrotor and charge pumps.
2. The Unistats are equipped with a built-in relief valve which is activated at 3000 psi to bypass fluid at excessive pressure. It will close when pressure has returned to normal. See Figure 8.1.

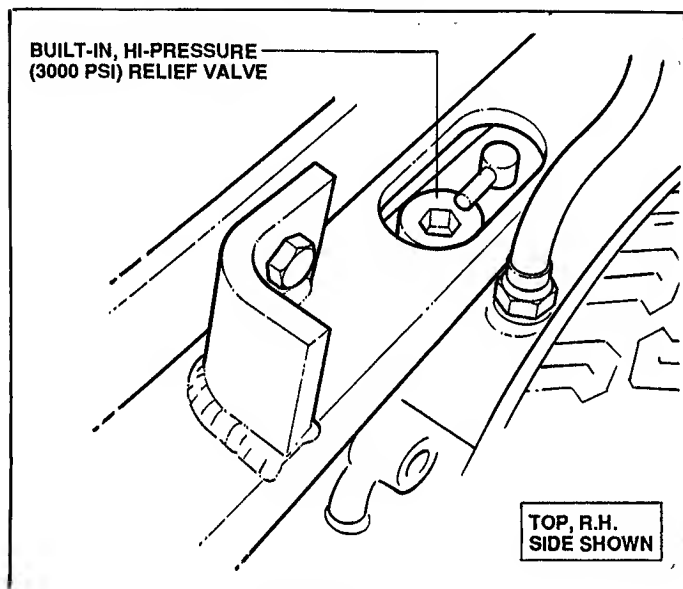


FIGURE 8.1

3. The built-in relief valve (See Figure 8.1) is a serviceable item. See Section VIII, Figure 9.16.
4. The remaining components of the Unistat are non-serviceable at the repair shop level. Damaged or non-working units must be returned to the manufacturer for adjustments or repairs.

B. HYDROSTATIC TRANSMISSION

The Hydrostatic Transmission is comprised of two parts: Gearbox and hydraulic drive unit. While the hydraulic drive unit must be returned to the manufacturer for repair, the gearbox can be serviced in the repair shop by following instructions found in SNAPPER Manual #07219, ZT DRIVE SERVICE MANUAL (The cover of this manual is shown in Figure 8.2).

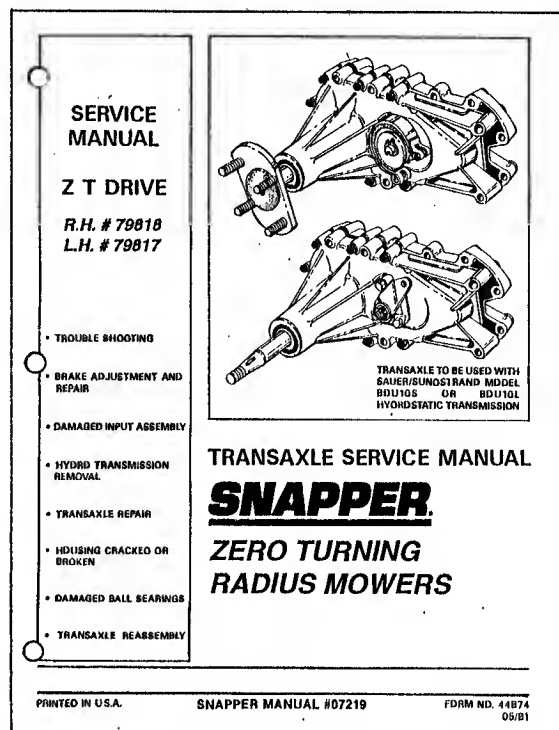


FIGURE 8.2

Section VIII - TRANSMISSION & DRIVE SYSTEM

8.2 HYDROSTAT DRIVE BELTS

When installing a new Drive Belt on any model unit, it is very important that the new belt be of the correct type and part number for the model being repaired! For this reason, there has been an updated (1992) HYDROSTAT BELTS chart included in this section (See chart below).

HYDROSTAT BELTS	
MODEL DESCRIPTION	HYDROSTAT BELT
GEAR DRIVE (JOYSTICK) SERIES 02 & 03	AK-70 D-3553 (797766) These belts MUST BE KEVLAR CORD!
UNISTAT 1810 & 2010	AK-28 D-3479 (79934)
UNISTAT 2013	AK-128 D-3479 (79934)
UNISTAT 2014	Primary - AK-42 D-3569 (62321) Secondary - AK-75 (62322) D-3570 (TO BE GIVEN)
CHAIN DRIVE "SK" FRAME	A-56 D-3517 (79564)
CHAIN DRIVE "LK" FRAME	A-56 D-3517 (79564)
CHAIN DRIVE "LB" FRAME	AA-55.5 D-3370 (79181)
CHAIN DRIVE "S"	AA-55.5 D-3370 (79181)

NOTE

Kevlar cord belts mate with "D" Groove pulleys as shown - not "V" Groove pulleys!



A. ADJUSTING DRIVE BELT (2-BELT UNISTAT)

1. Loosen 1st and 2nd stage locknuts (3 places). See Figure 8.3.

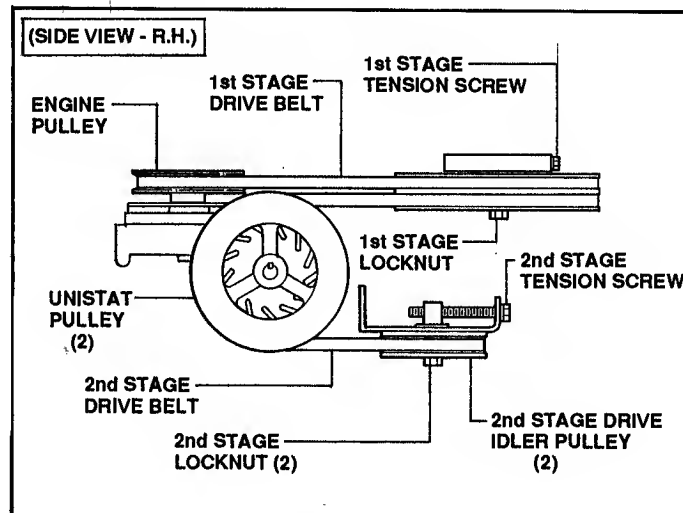


FIGURE 8.3

2. Release tension on 2nd stage drive belt by loosening the 2nd stage tension screw. See Figure 8.4.

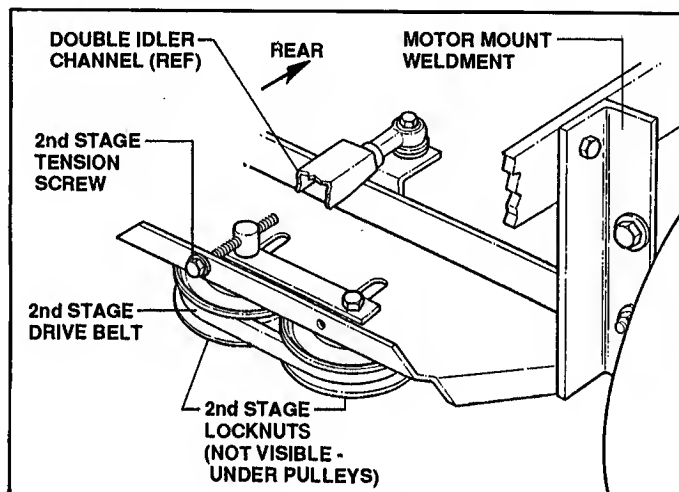


FIGURE 8.4

3. Tighten the 1st stage drive belt to the proper tension (10 lbs.) using the 1st stage tension screw.
 4. Tighten the 2nd stage drive belt to the proper tension using the 2nd stage tension screw. Retighten the 2nd stage locknuts.
 - (a) Belts should deflect approximately 1/4" to 1/2" (DO NOT OVERTIGHTEN).
 - (b) Check belt tension after 10-20 hours of use then re-check every 100 hours.
- B. ADJUSTING DRIVE BELT (1-BELT UNISTAT)
The following procedures for adjusting drive belt tension apply ONLY to those units having one (1) drive belt as shown in Figure 8.5.
1. Check tension of drive belt (AK-70 Kevlar cord) after first 25 hours of operation. Proper adjustment is from 1/4" to 1/2" deflection under 10 lbs. pressure.
 2. If adjustment is required, proceed as follows:
 - (a) Loosen the two (2) nuts holding the adjustment idler pulleys approximately one turn. This should allow the pulley idler slide to be just moved relative to the mounting bracket.

Section VIII - TRANSMISSION & DRIVE SYSTEM

- (b) Tighten the tension adjustment bolt until the drive belt deflects approximately 1/4" to 1/2" under 10lbs. pressure. **DO NOT OVERTIGHTEN BELT!**
- (c) Retighten pulley nuts to lock-in adjustment.
- (d) Tighten tension adjustment bolt 1/4 turn to set lockwasher. This will prevent loosening of tensioning bolt.

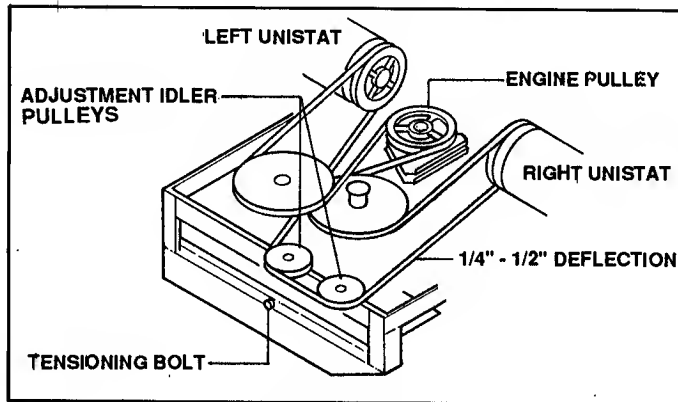


FIGURE 8.5

NOTE

KEVLAR cord main drive belt should be retensioned after 25 hours of usage, then every 200 hours of operation.

C. ADJUSTING DRIVE BELT (HYDROSTAT)

In normal use, the hydrostat drive belt tension should be checked after the first 25 hours of use for normal wear-in and stretch. It may be adjusted as follows:

1. Loosen the idler pulley locking nut until the idler pulley can be just moved relative to the mounting bracket. See Figure 8.6.

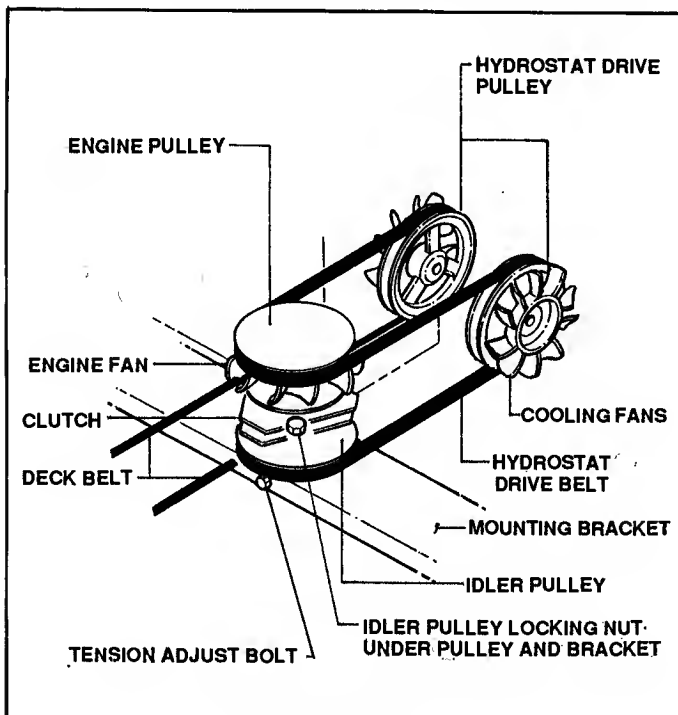


FIGURE 8.6

2. Tighten the tension adjust bolt until the belt is tight enough to prevent belt slippage. Belt should deflect approximately 1/4" to 1/2" under 10 lbs pressure. **DO NOT OVERTIGHTEN BELT!**
3. Retighten the slide locking nut.
4. Retighten the tension adjust bolt 3/4 turn to set the lockwasher and prevent loosening of the tension adjust bolts.

8.3 DRIVE BELT ROUTING

The following illustrations (Figures 8.7 thru 8.9) show the correct belt routing for the different drive systems.

A. UNISTAT (2-BELT)

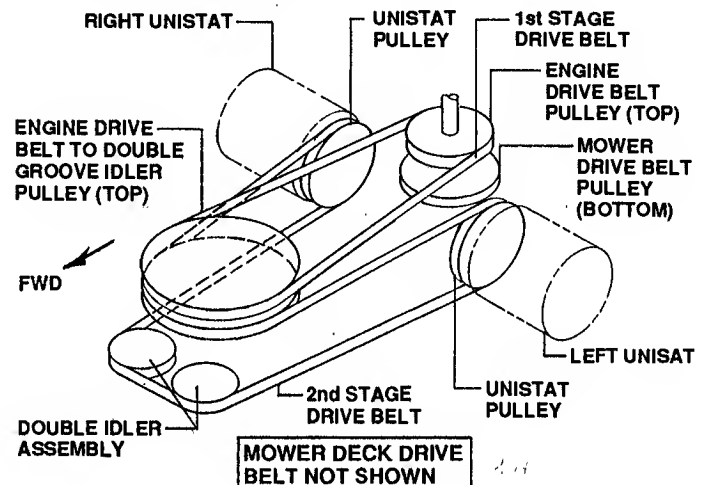


FIGURE 8.7

B. UNISTAT (1-BELT)

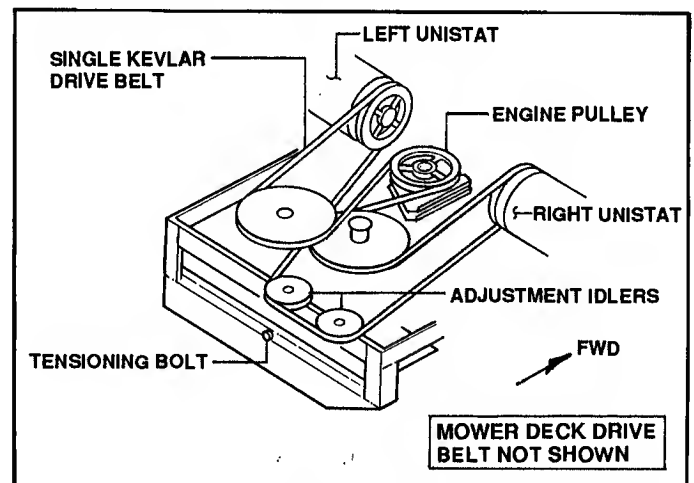


FIGURE 8.8

NOTE

After installing a new drive belt, check to make sure that it has 1/4" to 1/2" deflection under 10 lbs pressure. Drive the unit around for 5 minutes - recheck deflection and adjust if required.

Section VIII - TRANSMISSION & DRIVE SYSTEM

C. HYDROSTAT (1-BELT)

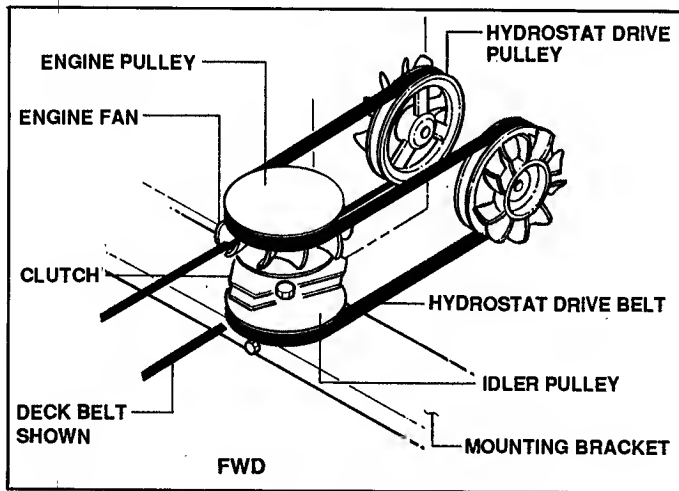


FIGURE 8.9

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Section IX

HYDRAULIC SYSTEM

MAINTENANCE & REPAIR

Section IX - HYDRAULIC SYSTEM - MAINT. & REP.

INTRODUCTION

The continued operation of the hydraulic system is largely dependent upon adherence to a properly scheduled maintenance program. For this reason, SNAPPER has provided the following information regarding lubrication, preventive maintenance and hydraulic system care.

9.1 HYDRAULIC SYSTEM

The importance of absolute cleanliness of the hydraulic system cannot be overstressed. The smallest amount of grit, metal flake, or other foreign material in the system can cause extensive damage to pumps, motors, and valves. SNAPPER has taken every precaution to assure that each component and fitting of each system was thoroughly cleaned before any unit was delivered to a customer. Therefore, servicing of the system should be done with extreme care.

- A. Before checking oil in reservoir, wipe away all dirt and grime around filler cap before removing cap. When adding oil, make sure containers, funnels, and pouring spouts are absolutely clean.
- B. When replacing hoses, fittings, or other components, clean thoroughly, then assemble carefully.
- C. Failure to observe these precautions, and failure to change the filter elements at regular intervals, could result in loss of customer warranty in the event of failure to certain components.

9.2 LUBRICATION & MAINTENANCE

The following general lubrication and preventive maintenance should be performed as scheduled in the operator's manual for each model of the unit.

- A. Inspect, repair, or replace any worn, cracked, leaking, or otherwise damaged components including, but not limited to, the following:
 1. Oil reservoir
 2. Hydraulic oil filter
 3. Hydraulic hoses and fittings
 4. Drive units
- B. Check hydraulic oil level in reservoir.
 1. Z Models - Fill to "FULL" mark on reservoir when COLD! (15W-50 Mobil One SYNTHETIC MOTOR OIL)
 2. ZU Models - Fluid level should be above the "ADD" mark when COLD. Level may be above the "FULL" mark when HOT. Fill reservoir(s) as required.
 3. Use 15W - 50 SYNTHETIC TRANSMISSION FLUID ONLY! (See "SUMMARY OF REQUIRED LUBRICANTS").

SUMMARY OF REQUIRED LUBRICANTS*

Hydraulic Oil - 15W - 50 Mobil One Synthetic Transmission Fluid or equivalent.

Examples: • Castrol Syntec™
• Continental™
• Amsol™
• Conoco Syncon™ AW-22
(USED ON EARLY UNISTATS)

ZU ONLY *

* For use on Unistat drives ONLY.

NOTE

If SYNTHETIC AUTOMATIC TRANSMISSION FLUID is not available locally, contact either of the following:

Mobile Products Services 1-800-662-4525
Amsol Product Center (Yellow Pages)

- C. Replace hydraulic filter elements after first 50 hours of operation, then every 250 hours thereafter.
 1. Use NAPA 1045 filters on all Unistat and Hydrostat drive units, using Mobil-One 15W-50.
 2. It is permissible to use up inventory of NAPA 1042 filters.

CAUTION ! ZU ONLY!

If oil filters are replaced with after-market filters, a restriction in oil flow will result! USE THE RECOMMENDED FILTERS ONLY!!

TO "FREEWHEEL" UNITS

9.3 A. UNISTAT TRANSMISSION

1. Turn the Hydraulic Dump Spool Lever 90 degrees to the mounting block (pointing towards the engine).
2. Raise the Manual Park Release Lock Lever so that it is parallel to the ground. See Figure 9.1. The unit will now freewheel.

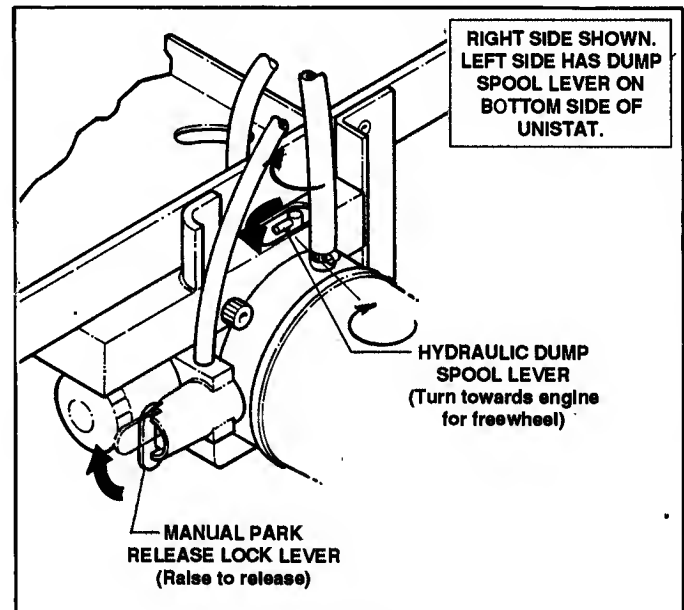


FIGURE 9.1

Section IX - HYDRAULIC SYSTEM - MAINT & REP

3. Repeat Steps 1 and 2 for left side.
4. Reverse above procedure to engage transmissions.

B. HYDROSTAT TRANSMISSION

1. The Transmission Release Levers are behind the seat and below the engine mounting plate.
2. Raise the levers slightly (to disengage) then push them to the rear and down to freewheel. See Figure 9.2.

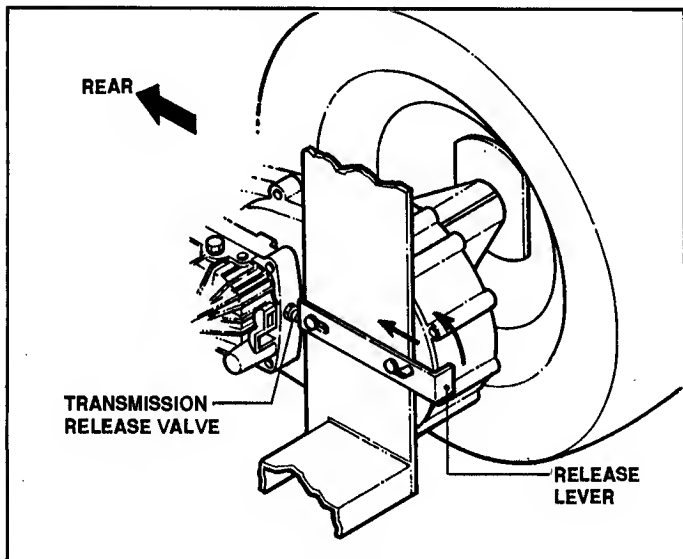


FIGURE 9.2

NOTE

Never PULL the mower over 2 MPH for any appreciable distance.

9.4 CHANGING HYDRAULIC FLUID

A. DRAINING UNISTAT TRANSMISSION

1. Start engine.
2. Drive mower around area until hydraulic fluid has warmed.
3. Park mower on level surface and stop engine.
4. Push PARK BRAKE lever forward to RELEASE (This will allow the small amount of fluid in the valve to be drained also).
5. Remove drain plugs from pump and motor housings on Unistat.
6. Remove oil filter.
7. Loosen cap on fluid reservoir and allow fluid to drain. See Figure 9.3.

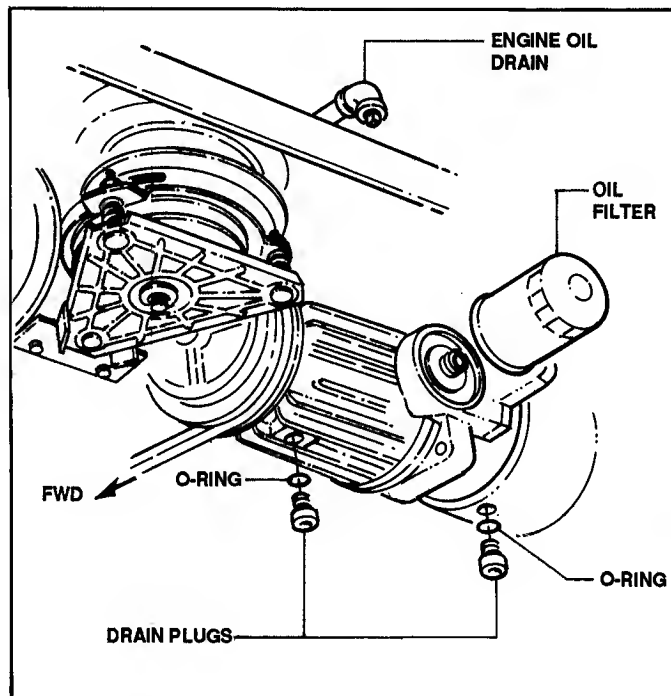


FIGURE 9.3

B. DRAINING HYDRAULIC FLUID RESERVOIR

1. Remove magnetic pipe plug from bottom of reservoir.
2. Allow reservoir to drain completely.
3. Clean and replace pipe plug. Tighten securely. See Figure 9.4.

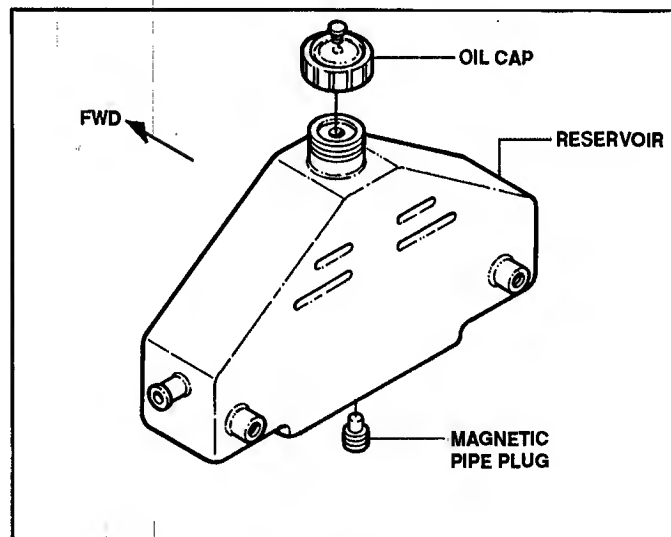


FIGURE 9.4

4. Remove oil cap and thoroughly clean cap and reservoir filler neck.

CAUTION!

Avoid getting ANY DEBRIS inside reservoir. Use a clean, lint-free cloth to remove dirt and grime from filler neck and oil cap!

5. Inspect reservoir for holes, cracks or leaks around fittings.

Section IX - HYDRAULIC SYSTEM - MAINT & REP

6. Inspect all connections, hoses, etc. for any leaks or signs of wear or deterioration. Replace components as required.

C. FILLING UNISTAT SYSTEM WITH FLUID

1. After fluid has drained from system, clean drain plugs and install NEW O-Rings before installing plugs. Tighten securely.
2. Install the new oil filters (hand-tighten only).
3. Fill reservoir with fluid (approximately 7 U.S. quarts for reservoir shown in Figure 9.4).
4. Start engine and add fluid as required to maintain proper level in reservoir. Replace reservoir cap.
5. Check reservoir level after engine has been running for one half hour. Add fluid as required.
6. Check all components of system for leaks.

9.5 HYDROSTAT TRANSMISSION (Units Equipped with Sauer/Sunstrand™ Transmsslon, Small Reservoir and Joystick Steering Control)

1. Start engine.
2. Operate mower until hydraulic fluid has warmed.
3. Park mower on level surface and stop engine.
4. Remove oil filter.
5. Loosen cap on fluid reservoir and allow fluid to drain. See Figure 9.5.

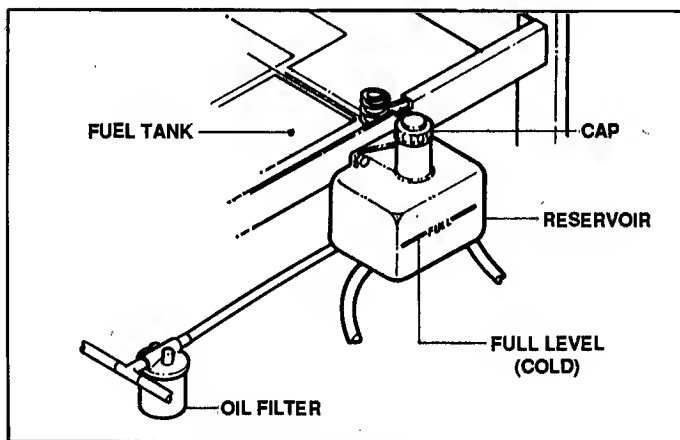


FIGURE 9.5

6. Clean all components and install new oil filter.
7. Fill reservoir with fluid (15W-50 Mobil-One Synthetic Motor oil).
8. Start engine. Add fluid as required until level has stabilized.
9. Replace reservoir cap.

NOTICE

DO NOT drain oil from transmission! Drain hydraulic system through oil filter ONLY!

9.6 HYDROSTAT TRANSMISSION (Units Equipped with Eaton™ Hydro and Chain-Reduction Drive)

1. Start engine.
2. Operate mower until hydraulic fluid has warmed.
3. Park mower on level surface and stop engine.
4. Check oil level in reservoir. Add fluid as required. See Figure 9.6 & "NOTICE".

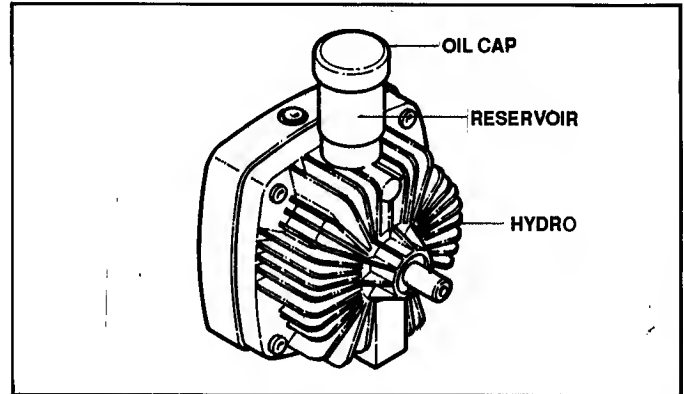


FIGURE 9.6

NOTICE!

To remove cap on early models, turn cap clockwise (early models have a silver label on cap). On late models, twist cap counter-clockwise one-quarter turn. Remove bladder (all models) and fill reservoir to markings on reservoir. Reinstall bladder and lightly tighten cap.

9.7 10S TO 10L HYDROSTAT CONVERSION (SNAPPER Kit #62380 Is Required for This Conversion)

NOTE

This conversion applies to the 1992 production of Models Z1202B, Z1402K, Z1802K & Z2002K only. It does not fit the dual cup models.

A. DISASSEMBLY

1. Hydrostat/Gearbox Removal
 - (a) Elevate rear of unit.
 - (b) Remove rear wheels.
 - (c) Disconnect shift cable from Hydrostat shift arm.
 - (d) Disconnect brake cable.
 - (e) Disconnect hydraulic hoses.
 - (f) Remove the four gearbox mounting bolts. See Figure 9.7.
2. Removal of Hydrostat from Gearbox
 - (a) Remove input pulley (fan) and key.
 - (b) Remove four mounting bolts and separate hydrostat from gearbox.
 - (c) Remove shift arm.
 - (d) Remove gear, bearing, spacer and snap

Section IX - HYDRAULIC SYSTEM - MAINT & REP

ring from Hydrostat output shaft (Take care not to overstress snap ring).

3. Repeat Steps 1 and 2 for other side.
4. Remove reservoir and hoses.
(See KIT INSTALLATION).

B. KIT INSTALLATION (#62308)

1. Oil Tank and Filter Installation

- (a) Install new oil tank.
- (b) Using drill template provided (Shown Full-Size in Figure 9.8), drill hole for mounting the oil filter hose.

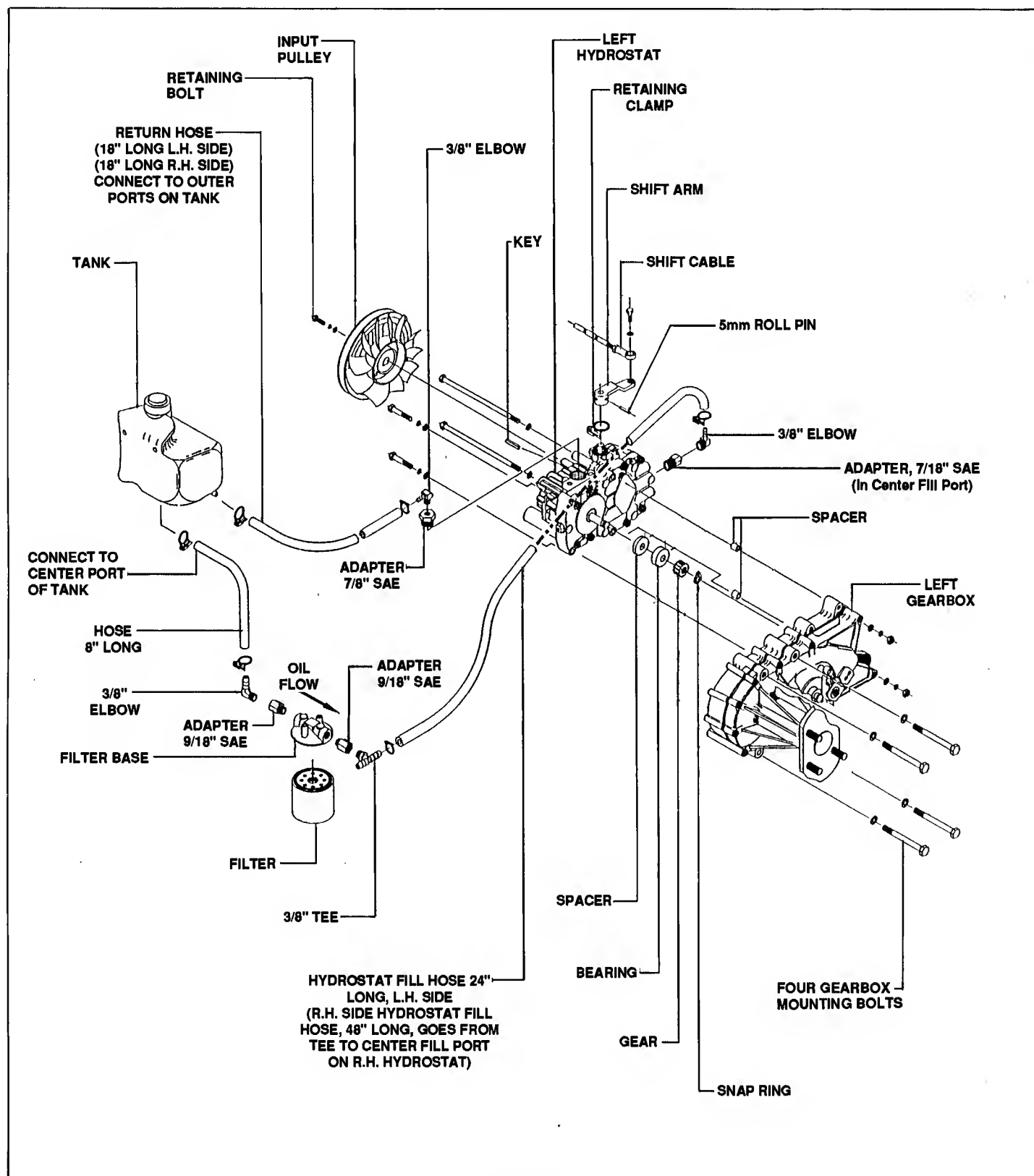


FIGURE 9.7

Section IX - HYDRAULIC SYSTEM - MAINT & REP

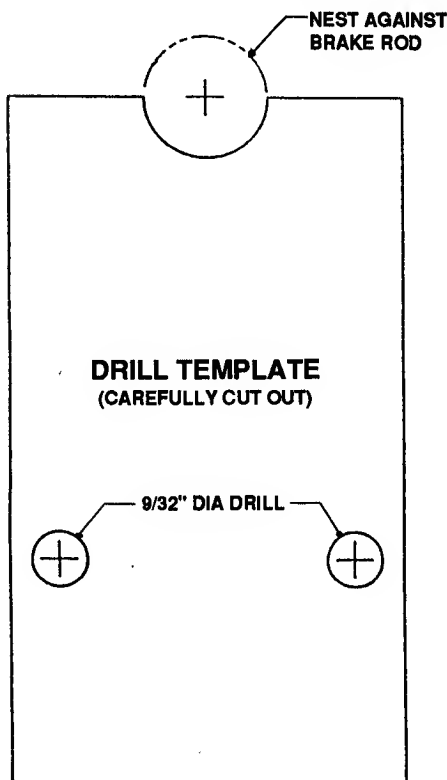


FIGURE 9.8

- (c) After drilling, bend the mounting plate up and in towards the center of the tractor approximately 90 degrees as shown in Figure 9.9.

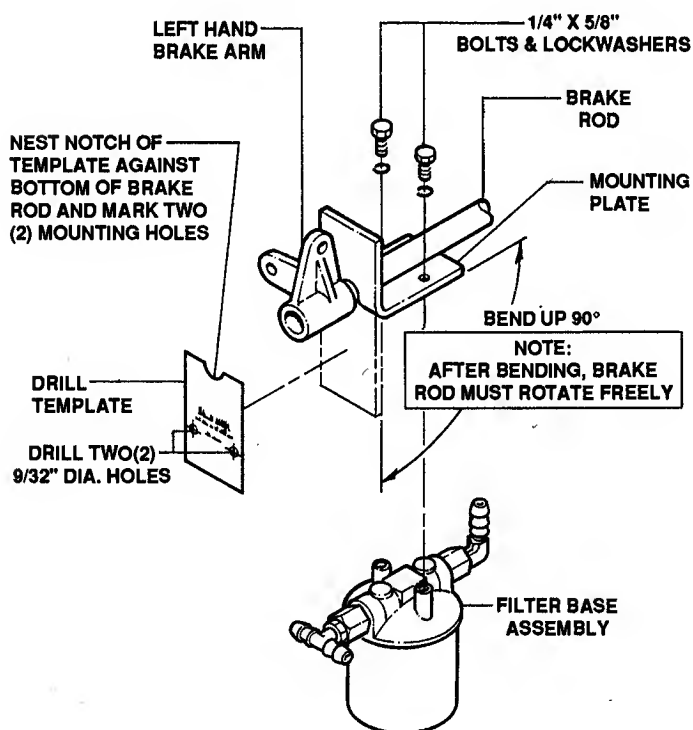


FIGURE 9.9

- (d) Install fittings on filter base and mount base to plate as shown in Figure 8.9.
 (e) Using clamps, connect the 6" long hose from the center port on the tank to the inlet port on the filter base (Refer to Figure 9.7).

2. Hydrostat/Gearbox Reassembly
 - (a) Install input pulley, key, retaining bolt and set screws.
 - (b) Install shift arm, roll pin and retaining clamp.
 - (c) Install spacer, bearing, output gear and snap ring (take care not to overstress the snap-ring during installation).
 - (d) Install new fittings for fill and return hoses as shown in Figure 9.7.
 - (e) Reassemble Hydrostat to the gearbox; place the bolts and spacers in the same order as they were removed.
 - (f) Install oil fill and return hoses and clamps as shown in Figure 9.7.
3. Hydrostat/Gearbox Installation
 - (a) Install the four mounting bolts.
 - (b) Connect the shift cable.
 - (c) Connect the brake cable.
 - (d) Connect the oil fill and return hoses as shown in Figure 9.7.
 - (e) Route and secure hoses with hose clamps and wire ties in such a manner that they will not strike belts or rub against sharp edges, etc.
4. Repeat Steps 2 and 3 for other side.
5. Reconnect and tension the Hydrostat drive belt.
6. Fill the oil tank to the FULL mark with 15W - 50 synthetic transmission fluid.
7. Start engine.
8. Shift Joystick control forward and reverse until smooth output is obtained at the drive wheels.
9. Check fluid level in tank. Add fluid as necessary to bring up to FULL mark.
10. Adjust the Joystick for neutral if necessary (See Section IV - Steering Controls).
11. Recheck drive belt tension.

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9.8 TRANSAXLE REPAIR

(ZT Drive - R.H. #79816, L.H. #79817)

See Figure 9.10.

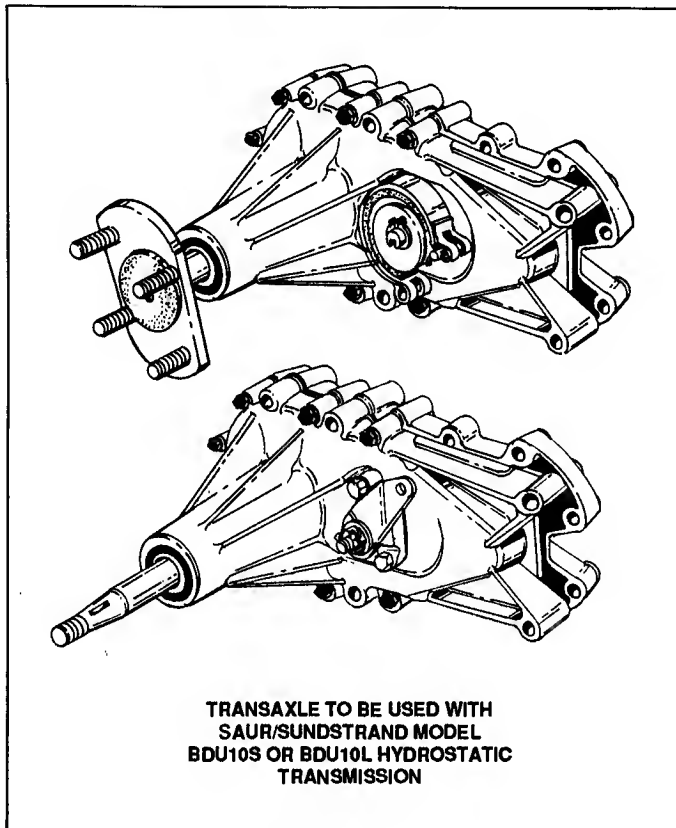


FIGURE 9.10

NOTE

The Transaxle called out above is used with Sauer/Sundstrand Model BDU10S or BDU10L Hydrostat Transmissions.

A current service manual on this unit is available from SNAPPER. Ask for Form No. 44674 (05/91).

9.9 UNISTAT REPAIR

Unistat Drives are used on ZU Models of the unit. Service of the Hi-Pressure relief valves (dump valves) is found under "C. Hi-Pressure Relief Valve(s)" in this text. At this time, service manuals covering other internal repairs to these units are not available. However, a description of operation, unit design features and a hydraulic flow diagram are presented in the following text as general information for repair personnel.

A. DESCRIPTION OF OPERATION

1. Basic Pump/Motor Service

- (a) A typical hydrostatic transmission consists of a variable displacement axial piston pump connected in closed circuit to a fixed displacement axial piston motor. There are two basic arrangements of hydrostatic transmissions:

- (1) A split system in which the pump and motor are mounted separately. Pressur-

ized fluid is contained and directed through hoses or tubing.

- (2) An integral system in which the pump and motor are contained in the same housing with pressurized fluid internally contained.

- (b) The variable pump (PV) is driven by a prime mover, typically an internal combustion engine. The fixed motor (MF) drives the vehicle transmission or other work function. Direction of rotation and speed of the motor shaft depends on the output flow of the pump. System pressure is dependent upon vehicle tractive resistance or other work function requirements. See Figure 9.11.

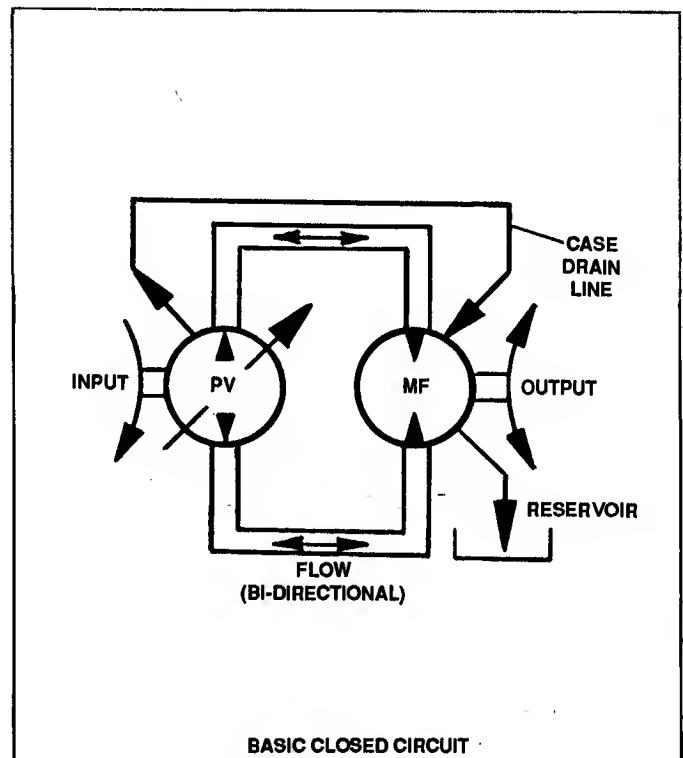


FIGURE 9.11

2. Variable Displacement Pump

The variable displacement pump (PV) is an axial piston design. It has a mechanical control connected to the swashplate. In operation, as the machine operator moves the control handle, the swashplate tilts. The tilting results in fluid flow from the pump, with the amount of fluid flow being proportional to the swashplate tilt angle. The direction in which fluid is pumped depends on input rotation and the side of neutral that the swashplate is tilted or stroked. Reversing the swashplate angle reverses the flow of fluid.

3. Fixed Displacement Motor

The fixed displacement motor (MF) is an axial piston motor that has the swashplate at a fixed angle, giving it a fixed displacement. The direction of motor shaft rotation depends on the direction of fluid flow through the motor. Changing the direction of fluid flow through the motor causes opposite motor shaft rotation.

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4. Direct Displacement Control

The variable displacement pump swashplate in both the Series 70 and Series 15 transmissions is directly controlled. For the Series 70 pump, any movement of the control shaft results in a proportional movement of the swashplate, with 21 degrees of swashplate rotation. For the Series 15 pump, any movement of the control shaft results in equivalent swashplate movement, with 15 degrees of control shaft rotation resulting in 15 degrees of swashplate rotation.

5. Charge Pump

- (a) Axial piston pumps and motors use a small amount of fluid for internal lubrication. This results in fluid being lost from the closed circuit that must be replenished. A fixed displacement gyrotor pump is used to replenish the lost oil. The gyrotor pump, called a charge pump, is driven by the prime mover through the piston pump drive shaft.
- (b) Since the piston pump and piston motor are connected in a closed circuit, either side of the hydrostatic loop may be pressurized. To allow charge oil to enter the closed circuit, two check valves are used to direct charge flow to the side of the loop with the lowest pressure.
- (c) The pressure in the charge pump circuit is limited by a direct operating relief valve. Any fluid not used as replenishing oil is discharged over this valve, either into the transmission case or recirculated back to the charge pump inlet. Flow across a small fixed orifice connecting the charge circuit with the transmission housing, supplements the cooling flow in the Series 70 transmissions.

See Figure 9.12.

6. Inlet Filter

It is imperative that only clean fluid enters the hydrostatic transmission circuit, therefore, a 20 micron (nominal rating) inlet filter is required in the charge pump inlet line. This filter should not have a bypass and should be changed regularly to ensure system reliability.

7. Bypass Valve

In some applications, it is desirable to move the machine for short distances at low speeds without starting the engine. A bypass valve allows oil to be routed from one side of the pump/motor circuit to the other, thus allowing the motor to turn. The bypass valve must be fully closed during normal vehicle operation.

- (a) Series 70 DU-10L and 21L transmissions utilize a spool type bypass valve. A spring closes this valve on the 10L transmission, while charge pressure closes the valve on the 21L transmission. The BDP-10L pump utilizes a screw-type bypass valve.
- (b) Series 15 PV, PT and inline units utilize a screw-type bypass valve which is fully open at 1/2 revolution of the valve stem. Series 15 U transmissions utilize the charge check valves for the bypass function. External plungers are depressed to hold the charge check balls off of their seats, allowing oil to bypass from one side of the pump/motor circuit to the other. See Figure 9.13.

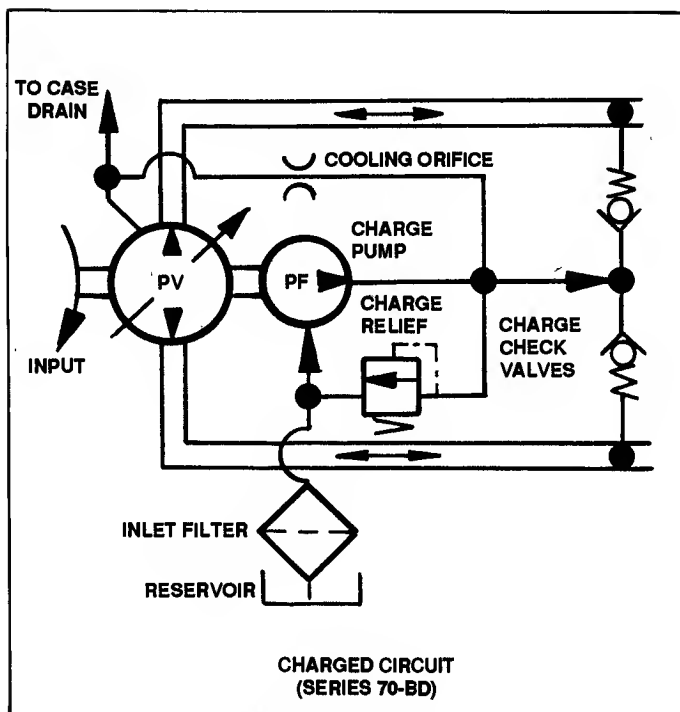


FIGURE 9.12

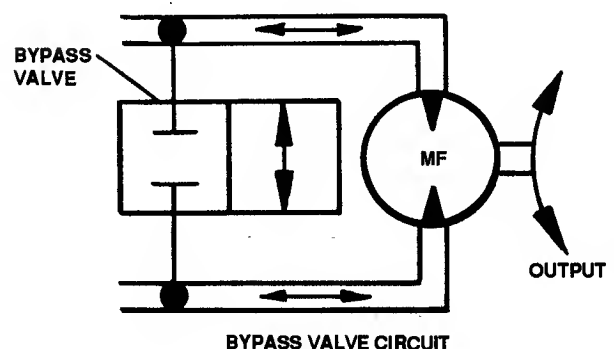


FIGURE 9.13

Section IX - HYDRAULIC SYSTEM - MAINT & REP

B. UNISTAT HYDRAULIC FLOW DIAGRAM. See Figure 9.14.

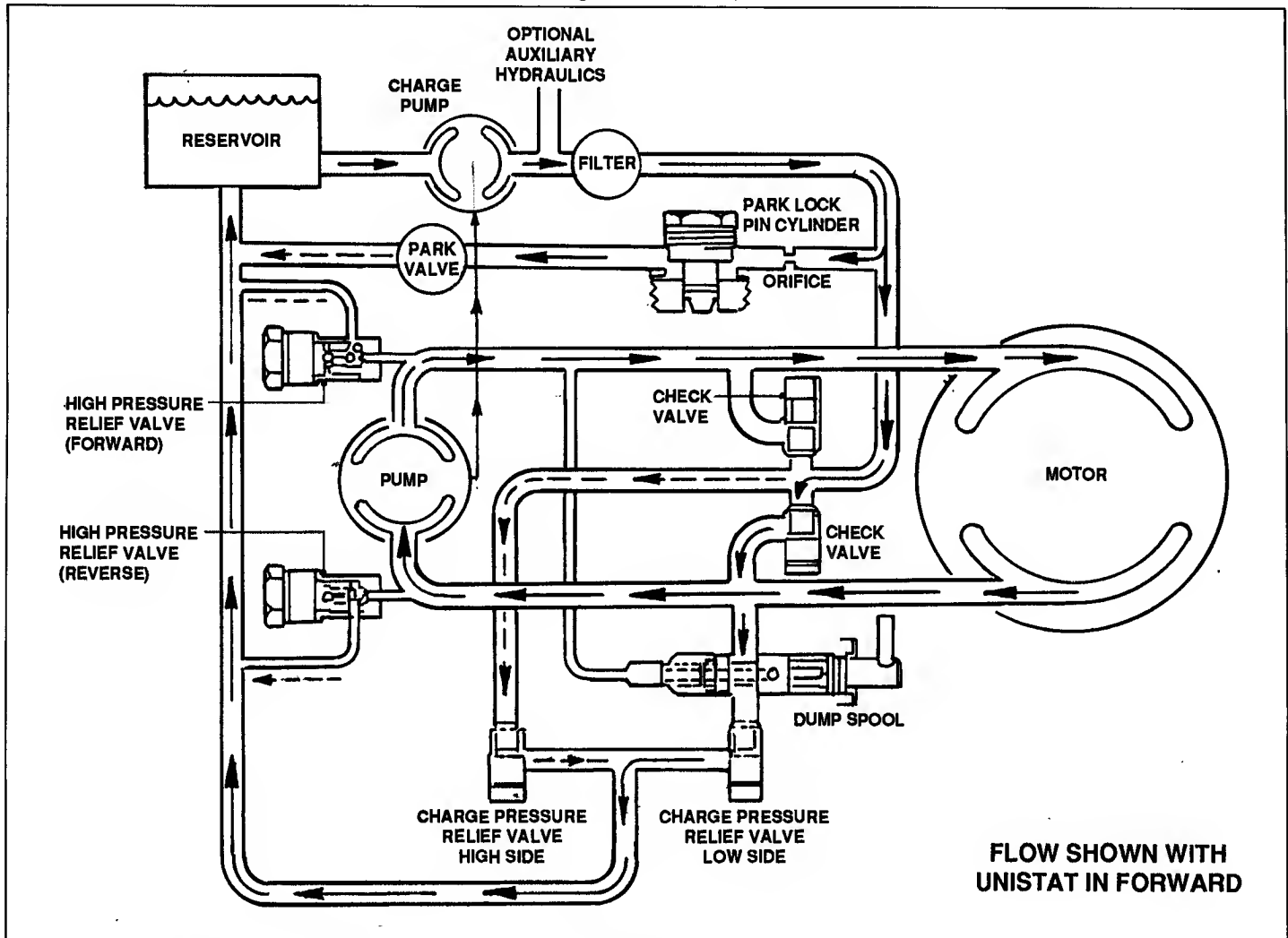


FIGURE 9.14

1. PRIMARY SYSTEM

This flow diagram shows how the oil is routed through the UNISTAT. Speed may be controlled by changing the amount of oil transmitted by the variable displacement axial piston pump to the fixed displacement axial piston motor by rotating the control shaft. The control shaft may be rotated an equal amount in both directions from neutral, permitting equal speed capabilities in both directions. The motor is driven by the oil flowing through a closed loop system which is circulated by means of a variable displacement pump. Due to leakage within the system, the amount of fluid returning to the pump is slightly less than what the pump requires, so check valves on the inlet side of the pump open to charge pressure which replenishes the pumps need for oil.

2. SECONDARY SYSTEM

The charge pump is supplied with oil from within the pump housing. Its function is to supply the primary system with oil to replenish any oil loss due to leakage. It also provides a means of circulating some of the system oil through a filter (when the unit is in forward). Also, this secondary system provides enough pressure to disengage an automatic park lock pin designed into the unit.

CAPACITIES CHART		
CHARGE PUMP	CID .475	Theoretical GPM @ 2200 RPM - 4.52
SYSTEM PUMP	CID 0 to .605	Theoretical GPM @ 2200 RPM - 5.76
HYDRAULIC MOTOR	CID 10.01	Theoretical Max. Output RPM - 132 @ 5.76 GPM
RESERVOIR CAPACITY 1.5 Gallons Min.		

Section IX - HYDRAULIC SYSTEM - MAINT & REP

C. HI-PRESSURE RELIEF VALVE(S) (Also Referred to as "HPRV" Valves)

1. Each Unistat is equipped with two hi-pressure (3,000 PSI) relief valves which help prevent damage to the transmission in cases of extreme hydraulic pressures. One valve is located adjacent to the Unistat "Dump Spool Lever" (See Figure 9.15) on top of the housing while the other is located in the center of the housing on bottom.

- (a) An indication that an o-ring has failed is that one or the other Unistats lose power in that direction which the unit is traveling.
- (b) Another indication is that, when the switch is turned off, one brake or the other IS NOT automatically applied by the system pressure.

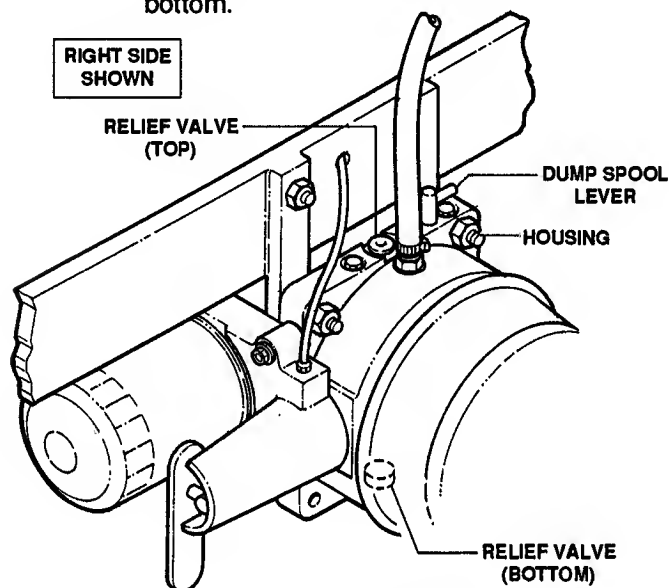


FIGURE 9.15

2. The top relief valve protects the system (left side only) while the unit is traveling forward; the bottom valve when the unit is in REVERSE.
3. The pressure relief valves are serviceable to the point that the o-rings can be replaced should they become damaged; otherwise, the valve must be replaced if it fails. See Figure 9.16.

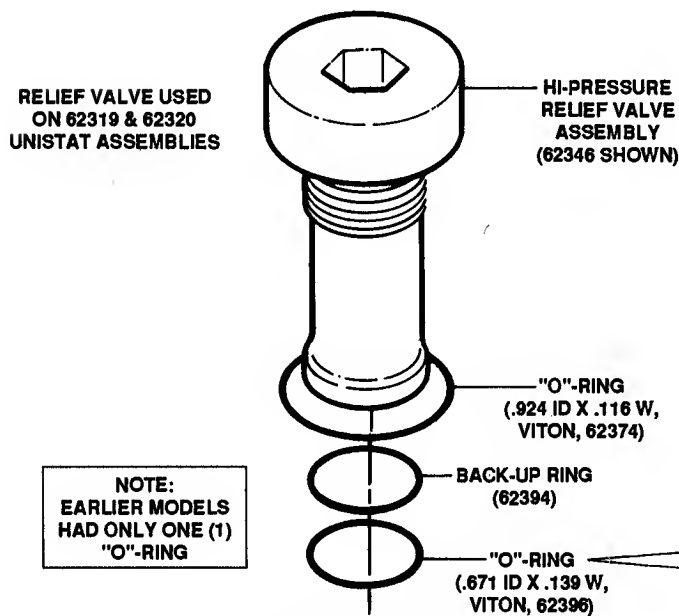


FIGURE 9.16

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Section X

BRAKE

ADJUSTMENTS & REPAIR

Section X - BRAKE ADJUSTMENT & REPAIRS

INTRODUCTION

This section covers procedures for the adjustment, disassembly and repair of the Parking Brake Systems used on Zero Turning Radius Mowers.

10.1 PARKING BRAKE SYSTEM

(UNISTAT - POWERED MODELS)

A. PARKING BRAKE ADJUSTMENT

The Parking Brake on the Unistat is automatically adjusted inside the unit. If the Park Brake fails to hold, repair of the Unistat is required.

B. PARKING BRAKE ASSEMBLY

Shown below in Figure 10.1 are the replaceable components of the Parking Brake Assembly. Should the Park Brake fail, and the Unistats are still functioning normally, then each of the parts shown below should be checked for malfunction before replacing a Unistat.

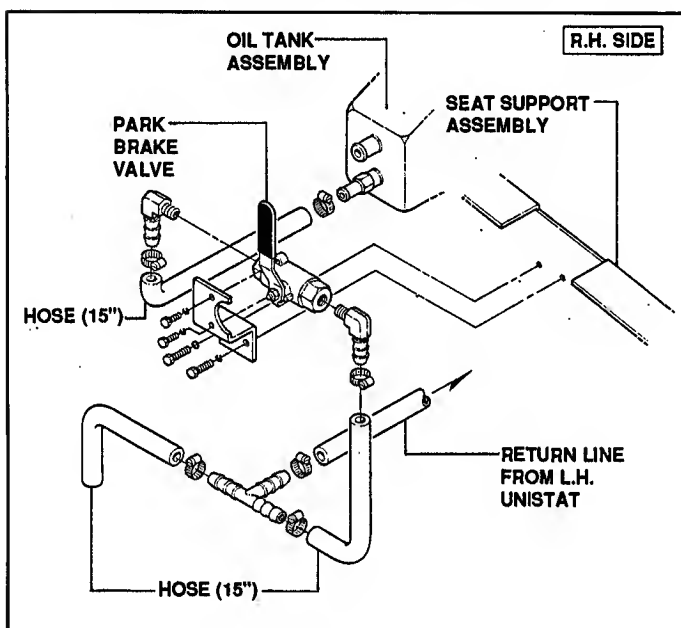


FIGURE 10.1

NOTE

When Parking Brake fails to hold, ALWAYS CHECK the Manual Park Release Lock Levers first to make sure they are not in the "UP" position. Refer to Section IX, Figure 9.1.

Also, check the "Dump" Valve on each Unistat to make sure that the valve handle is in correct operating position (Locked).

10.2 PARKING BRAKE SYSTEM

(HYDROSTATIC - POWERED MODELS)

This system consists of a hydraulic motor and gear-driven transmission. Although there are a number of variations in the types of motors and transmissions used, there are only two parking brake systems: Brake Band and Disc Brake.

If the Park Brake of either system fails to hold, adjust as follows:

A. BRAKE BAND ADJUSTMENT - EARLIER MODELS

1. Place Parking Brake Handle in the "Set" position.
2. Visually check to see if the Brake Band is in contact with the brake drum on the transmission.
3. If brake is found to be out of adjustment, release brake and adjust the brake rod (or cable) until the Brake Band is *just touching* the drum.
4. Set brake and test for hold.

B. BRAKE BAND REPAIR - EARLIER MODELS

1. Disconnect brake rod from actuating rod.
2. Remove Brake Band by removing cotter pin. Pull Brake Band off and inspect pad inside band for wear. Replace if necessary. See Figure 10.2.

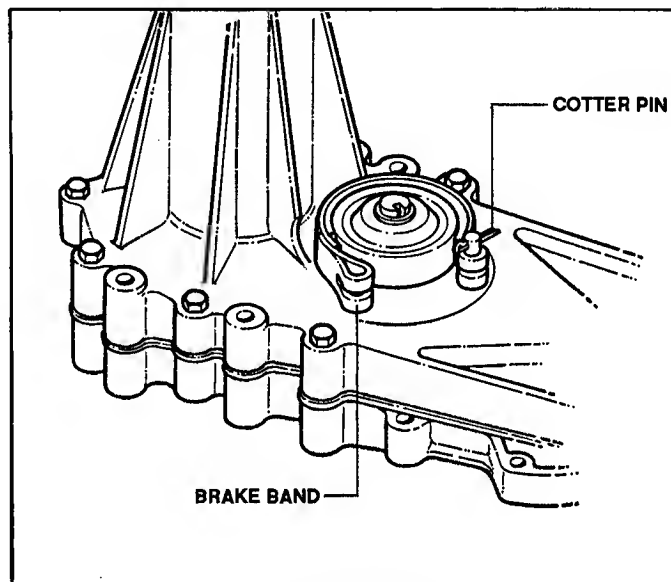


FIGURE 10.2

3. Remove brake drum by removing retaining ring. Pull drum off of brake shaft and inspect drum for wear or damage. Replace if necessary. See Figure 10.3.

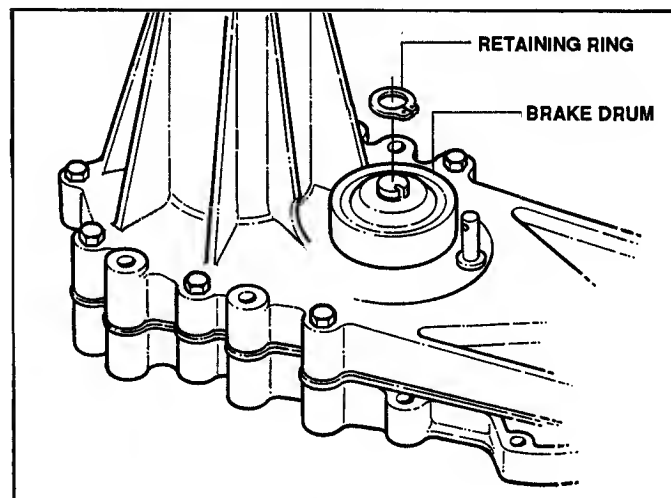


FIGURE 10.3

Section X - BRAKE ADJUSTMENTS & REPAIRS

4. Inspect bearing area of brake shaft for grease leakage. Use a degreasing solvent to clean brake area thoroughly for reassembly.
5. Reassemble the brake drum, retaining ring, brake band and cotter pin.
6. Reconnect brake rod to brake and adjust as required.

C. DISC BRAKE ADJUSTMENT

1. Place parking brake handle in "SET" position.
 - (a) Using a feeler gauge, check the gap between brake disc and pads. Gap must be adjusted to within .010 to .020 minimum. Tighten or loosen castle nut to adjust clearance. See Figure 10.4.

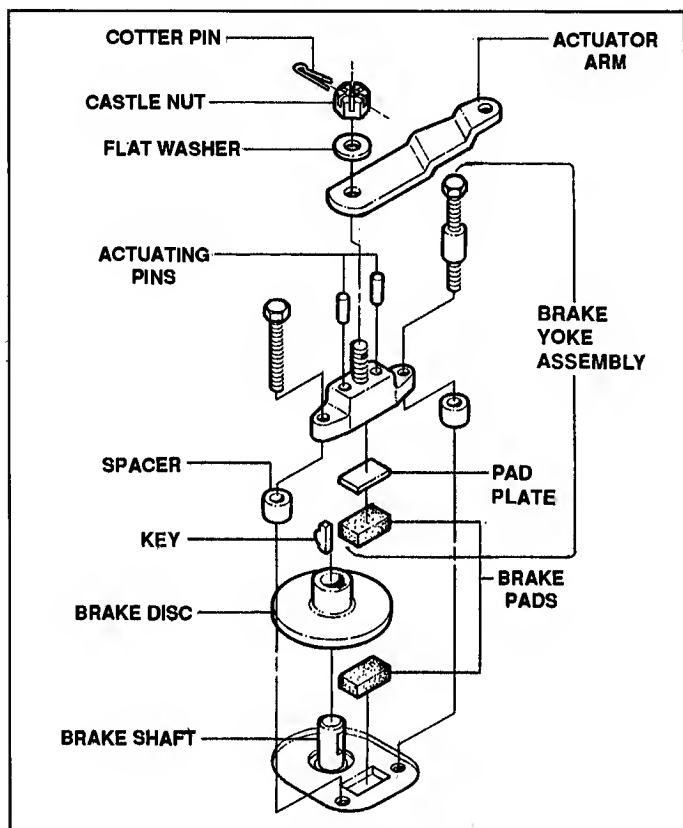


FIGURE 10.4

- (b) Adjust the nylock nut on the brake cable until the cable has 1/4" to 1/2" deflection at mid-span. See Figure 10.5.

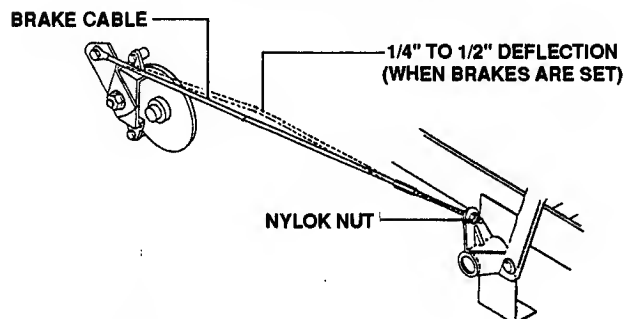


FIGURE 10.5

- (c) Repeat for other side of machine.
- (d) After adjusting cables, repeat Step (a).

D. DISC BRAKE REPAIR

1. To install new pads, remove bolt and spacer securing the Brake Yoke Assembly.
2. Remove the remaining bolt from the Brake Yoke Assembly. See Figure 10.6.

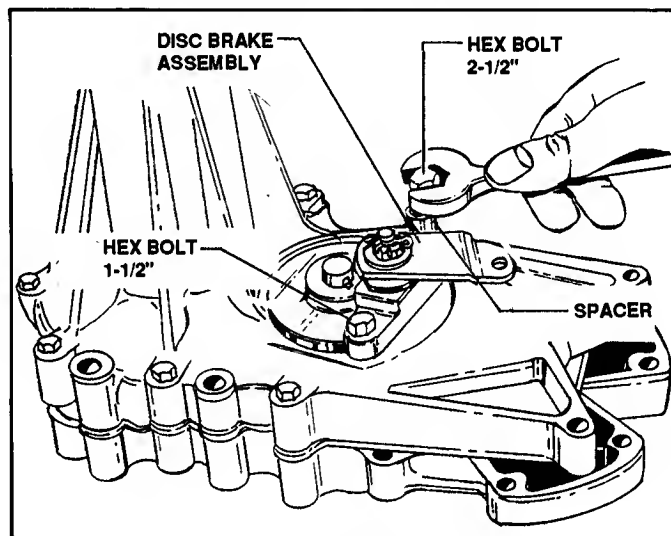


FIGURE 10.6

3. Pull Brake Assembly off housing.

NOTE

Pad Plate and Brake Pad will drop off Yoke Assembly.

4. Pull disc from brake shaft and inspect bearing for grease leakage.
5. Remove cotter pin, castle nut, flat washer and actuator arm from Yoke Assembly (Refer to Figure 10.4).
6. Remove actuating pins from Brake Yoke Assembly and check for excessive wear of pins or actuator arm. Replace parts as required.
7. Use a degreasing solvent to clean brake area before reassembly.
8. Before reassembly of brake, use a graphite, dry-slide lubricant on the brake shaft, actuating pins and the cam area of the actuating arm (Use ample lubricant!).
9. Install inner brake pad in axle housing. See Figure 10.7.
10. Reinstall brake disc and key.
11. Reassemble Brake Yoke Assembly by installing actuating pins, pad plate and brake pad (Secure brake pad with tape for ease of assembly).
12. Install the flat washer and castle nut. Hand tighten only!
13. Rebolt Yoke Assembly using Locktite™ No. 242. Torque bolts to 80-120 inch/lbs.

Section X - BRAKE ADJUSTMENTS & REPAIR

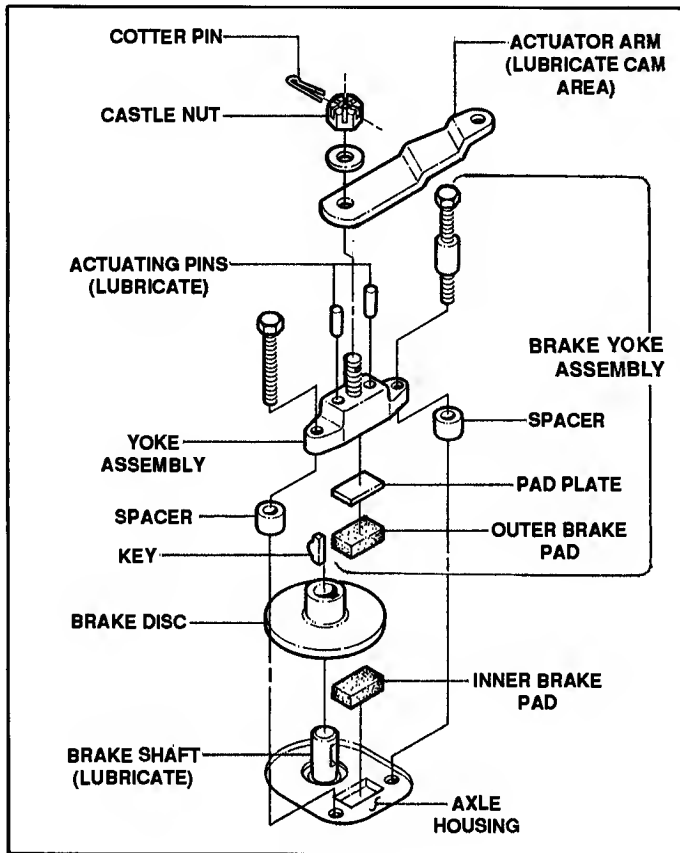


FIGURE 10.7

14. Check gap between brake disc and inner brake pad with feeler gauge. Gap must be adjusted to .010 to .020 minimum by tightening or loosening castle nut.
15. Reinstall cotter pin through castle nut and bend ends of cotter pin over.
16. Reconnect brake rod to actuator arm.

9.3 MANUAL PARKING BRAKE SYSTEM (TWO-HANDLE STEERING MODELS)

Shown below in Figure 9.8 is an illustration of the Model S, LB & LK Frame units. This is the early, two-handle model and features a manually-operated mechanical parking brake.



FIGURE 9.8

A. BRAKE ADJUSTMENT

If Park Brake fails to stop or hold mower on hills, adjust Park Brake as follows:

1. Remove fasteners from right fender cap assembly and move it aside (be careful not to disturb wiring or linkage connections).
2. Remove right fender assembly.
3. Remove nut and screw from brake link and brake arm. See Figure 10.9.

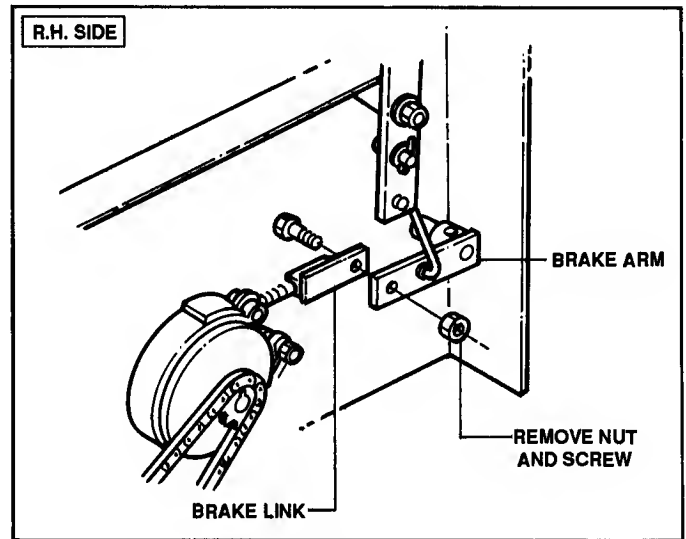


FIGURE 10.9

4. Turn brake link clockwise to tighten brake.
5. Reassemble brake link and brake arm. Readjust if required.

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Section XI

CUTTER UNITS

Section XI - CUTTER UNITS ADJUSTMENTS & REPAIRS

INTRODUCTION

This section covers procedures for the adjustment, disassembly and repair of those cutter deck components used on the SNAPPER Z and ZU Zero Turning Radius Mowers.

These cutter deck components include the drive belts, spindles, idler assemblies and deck caster wheels (60" deck). See Figures 11.1 and 11.2 for familiarization drawings of the 48" and 60" cutter deck components.

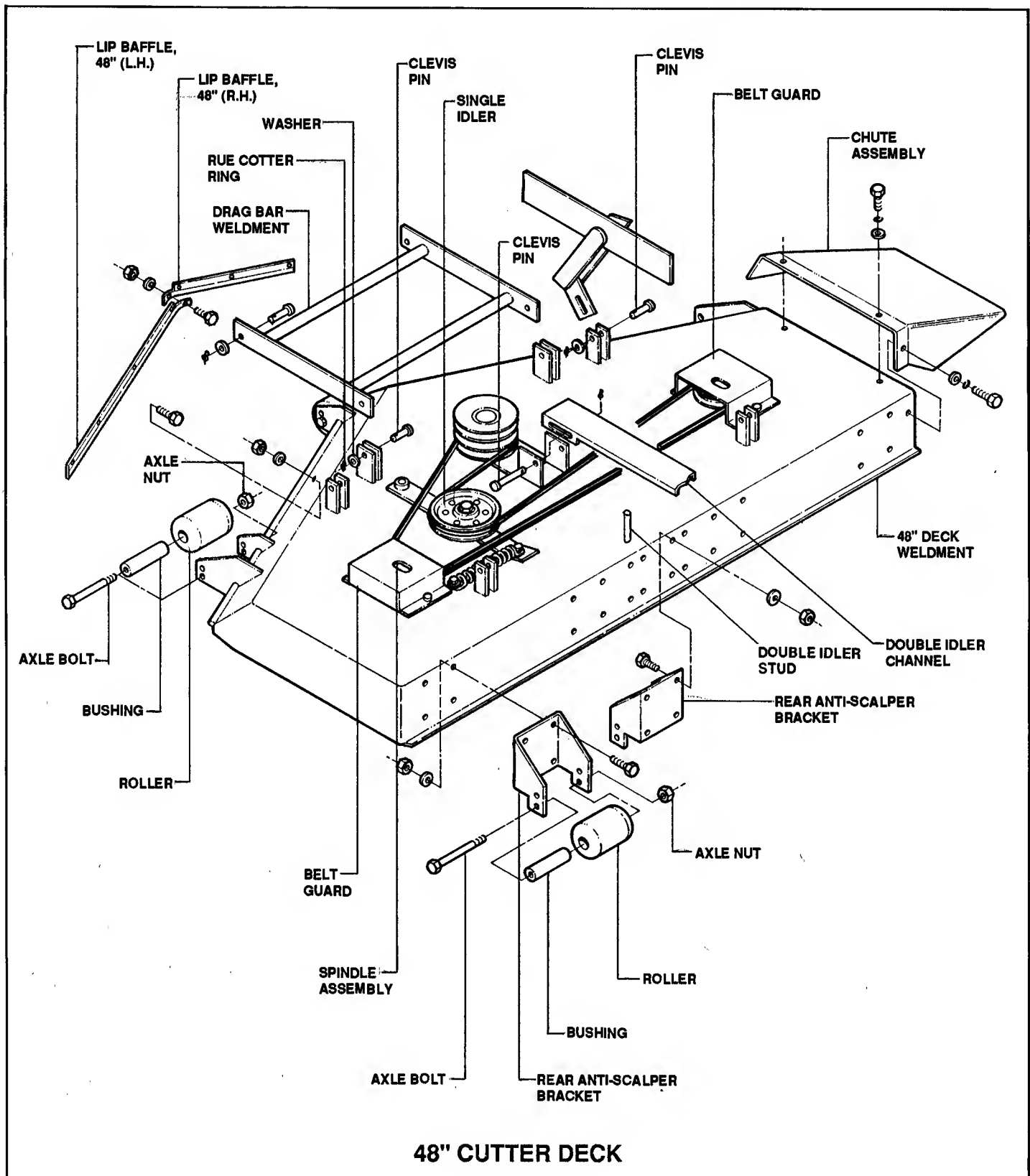


FIGURE 11.1

Section XI - CUTTER UNITS ADJUSTMENTS & REPAIRS

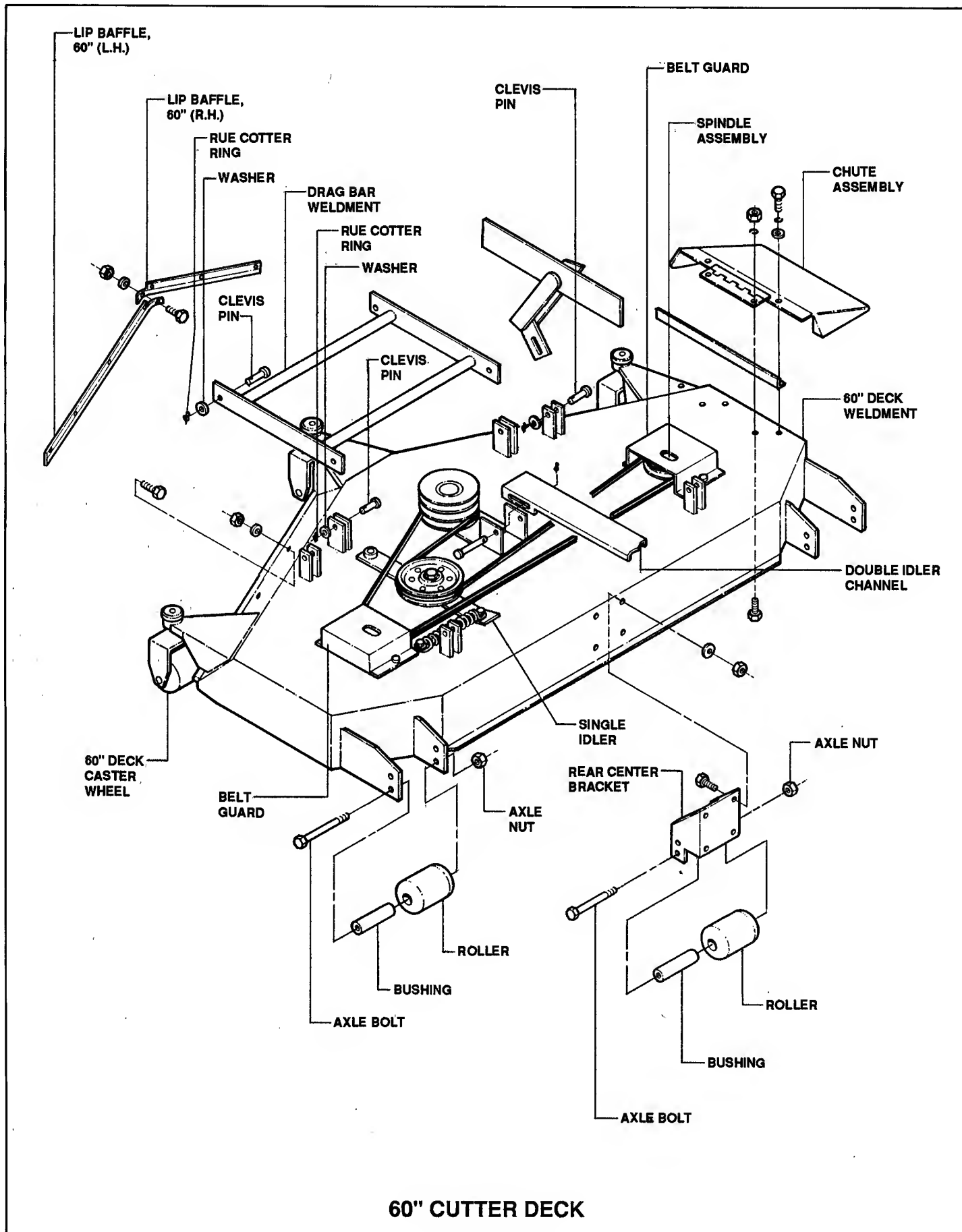


FIGURE 11.2

Section XI - CUTTER UNITS ADJUSTMENT & REPAIR

11.1 ADJUSTING DECK LEVEL

Deck level is controlled by tire pressure on both the 48" and 60" mowers. If the mower is cutting unevenly from side to side, check to see if tire pressures are the same on both sides of the mower. Correct tire pressure is required to level deck.

TIRE PRESSURES			
Tractor Model	Front Tires		Rear Tires
Z1202B, Z1203B	10"	12 psi	18" 12 psi
Z1402K, Z1802K Z2002K	13"	12 psi	20" 12 psi
Z1403K, Z1803K & Z2003K	13"	12 psi	20" 12psi
1810 & 2010	10"	12 psi	20" 12 psi
ZU2013K	13"	12 psi	20" 12 psi
ZU2014K	13"	12 psi	23" 12 psi

11.2 ADJUSTING HEIGHT OF CUT

Height of cut is controlled by moving the deck lift lever to any one of seven positions. See Figure 11.3.

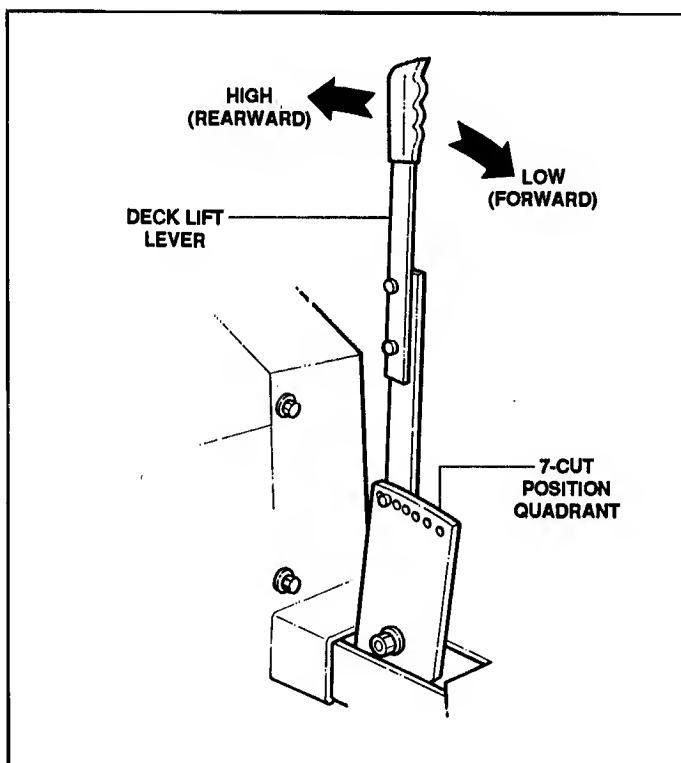


FIGURE 11.3

DECK SPECIFICATIONS			
Deck Model	Cutting Height	Cutting Width	Blades
Z4102M	1.5" - 3.75"	41"	(2) 20 1/2"
Z4202M	1.75" - 4"	42"	(3) 15"
Z4802M	1.75" - 4"	48"	(3) 17"
Z6002M	1.75" - 4"	60"	(3) 21"
ZU4804M	2" - 5" *	48"	(3) 17"
ZU6004M	2" - 5" *	60"	(3) 21"
* With Lift Hanger Adjustment.			

IMPORTANT!

Cutting level or cutting height may be adversely affected if one or more of the deck spindles have been improperly installed! The "V" notch in the front of each spindle flange locates the thicker section of the flange to the front when properly installed (This sets the spindle at the correct cutting angle). Should the "V" notch be located in any direction other than forward, the spindle should be taken loose and properly oriented. See Figure 11.4.

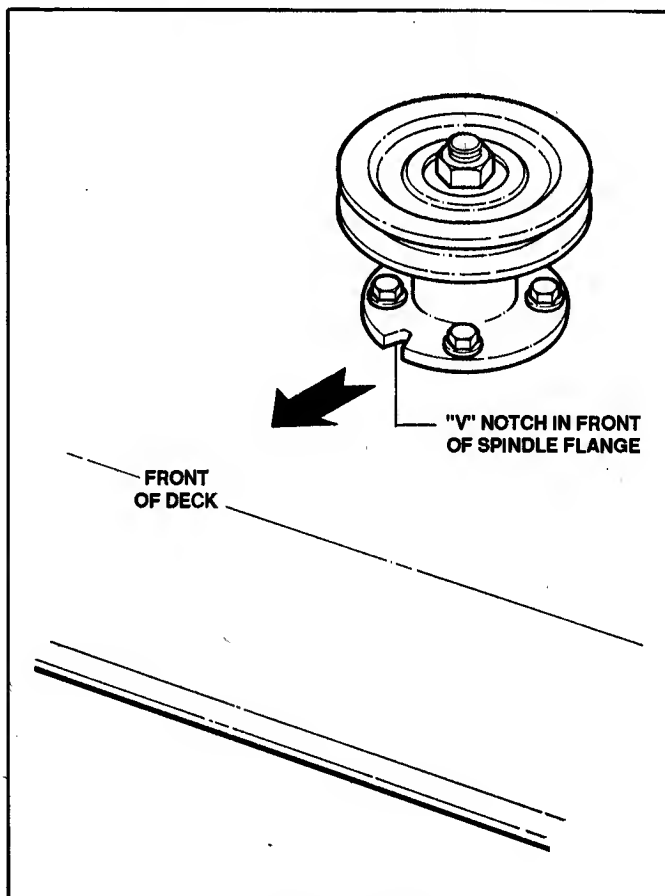


FIGURE 11.4

Section XI - CUTTER UNITS ADJUSTMENTS & REPAIRS

- 11.3 HOW TO SOLVE STREAKING PROBLEMS**
Should there be a "streaking" problem that cannot be remedied by adjustments, then a "HI-LIFT" blade installed next to the discharge chute should solve the problem. See Figure 11.5.

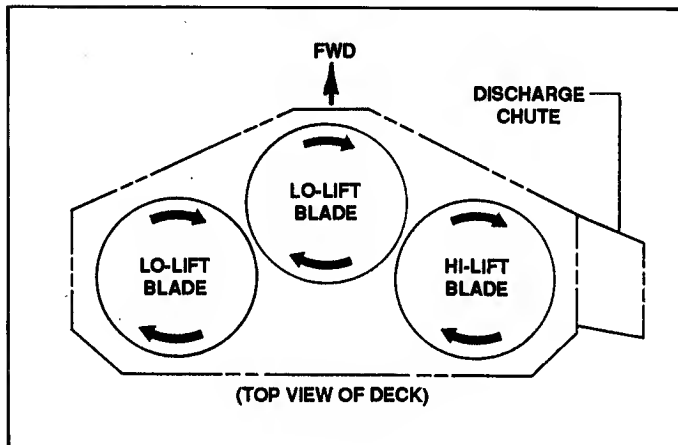


FIGURE 11.5

- 11.4 ADJUSTING DECK-LIFT TENSION SPRING**
The deck is lifted (and lowered) manually by the operator. To make the deck easier to lift (or lower) the deck-lift lever is adjusted as follows:
A. Turn the adjusting bolt counterclockwise (allowing spring to compress) to lessen effort required to operate deck. See Figure 11.6.

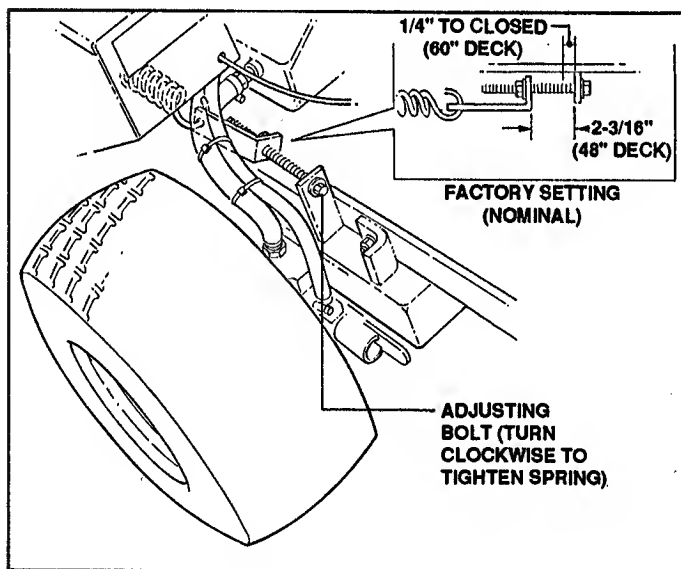


FIGURE 11.6

- B. To increase the effort required to operate the deck, turn the adjusting bolt clockwise (this will extend the spring).

NOTE

Factory setting of deck-lift tension spring is shown in Figure 11.6.

- 11.5 DECK REMOVAL (48" & 60" DECKS)**
A. Park unit on flat surface.
B. Rotate both front caster wheels forward.
C. Using the lift lever, lower the deck to its lowest position.
D. Remove the two clevis pins from the outer front deck supports and deck hanger bars. Lower front of deck to ground. See Figure 11.7.

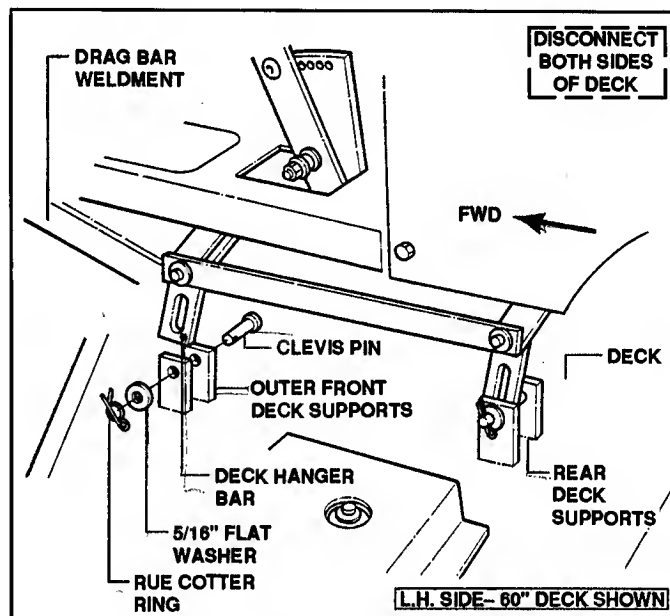


FIGURE 11.7

NOTE

Lift front of deck to relieve pressure on the clevis pins.

- E. Remove the two clevis pins from the inner front deck supports and drag bar weldment. See Figure 11.8.

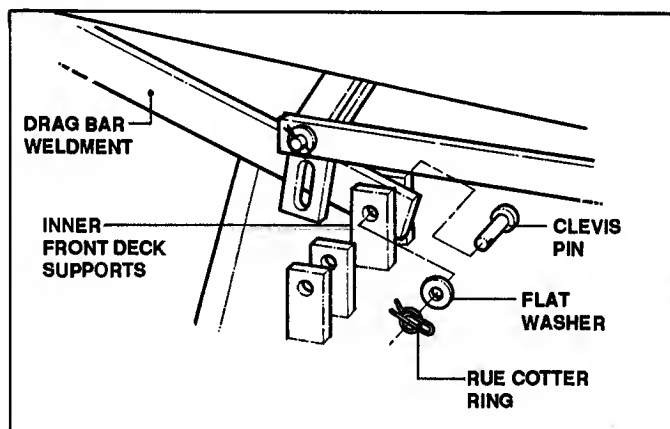


FIGURE 11.8

- F. Remove mower drive belt from deck drive pulley.

Section XI - CUTTER UNITS ADJUSTMENTS & REPAIR

- G. Remove clevis pin from front of idler channel assembly. See Figure 11.9.

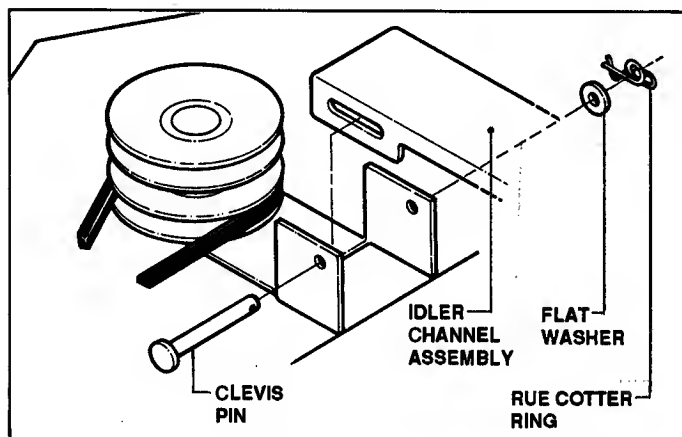


FIGURE 11.9

- H. Remove the two clevis pins from the rear deck supports and deck hanger bars. Refer to Figure 11.7.
I. Pull deck out from left side of mower.
J. Reinstall deck in reverse order.

11.6 DECK COMPONENTS

A. MOWER BLADES

The mower blades should be inspected whenever the mower deck is removed for servicing. This inspection can be visual, the blades do not have to be removed.

CAUTION!

Always remove ignition key and disconnect spark plug wires before performing any service on deck.

1. Check the blade(s) for obvious damage such as bends, large nicks or chunks resulting from hitting solid objects. **DO NOT** attempt to repair a damaged blade. Replace it with a new genuine SNAPPER blade. See Figure 11.10.

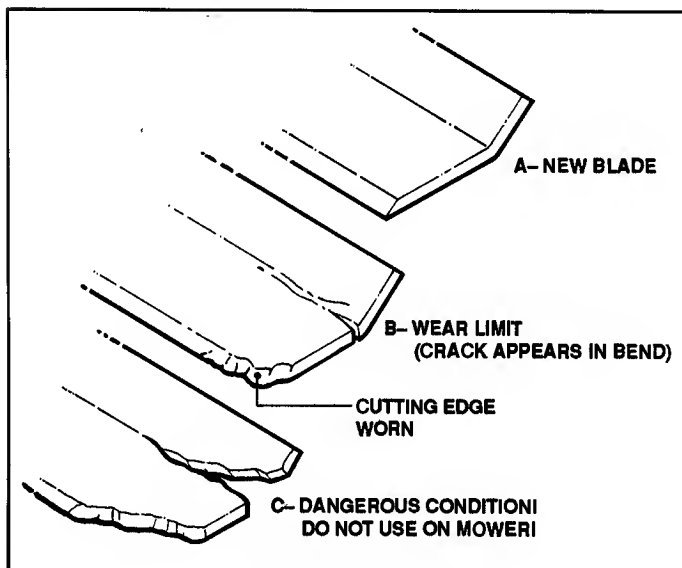


FIGURE 11.10

2. Always check condition of the blade retaining hardware. This is very important to assure that they will not loosen during operation. Replace any blade retaining fasteners which appear damaged or worn, with genuine SNAPPER parts only - **DO NOT** use any substitutes or unauthorized replacements and double check to make sure the correct part number is used. See Figure 11.11.

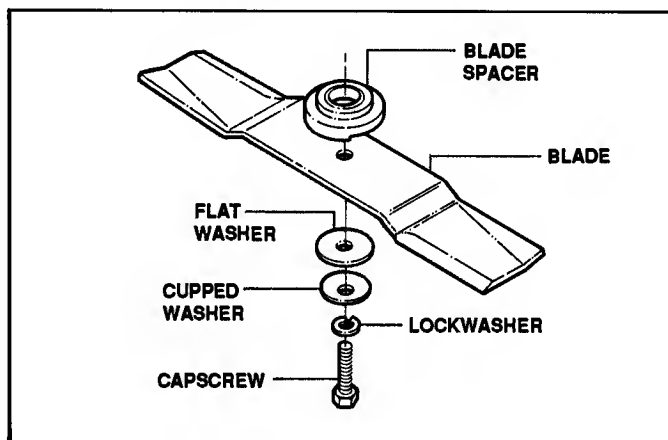


FIGURE 11.11

3. Examine cutting edges of blade(s) for sharpness. Dull blades produce ragged cuts and make the engine work harder, thus increasing fuel consumption and requiring lower ground speeds to do the job. Keep the blades sharp!

B. BLADE SHARPENING PROCEDURE

WARNING!

Always wear safety glasses and protective gloves when grinding or sharpening mower blades.

1. After removing the blades, lay each on a smooth, flat surface to check for straightness. Both cutting edges should be flat or angled downward, **NEVER** upward! See Figure 11.12.

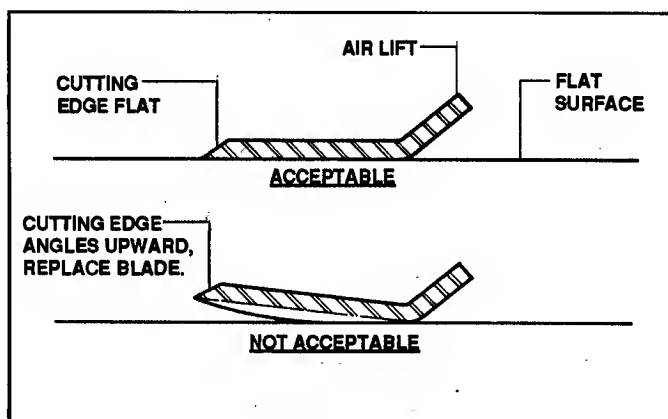


FIGURE 11.12

Section XI - CUTTER UNITS ADJUSTMENTS & REPAIRS

- When sharpening a blade, maintain the twenty-five degree angle of the cutting edge. Sharpen only the TOP SIDE of each cutting edge. To maintain balance, grind each cutting edge an equal amount. See Figure 11.13.

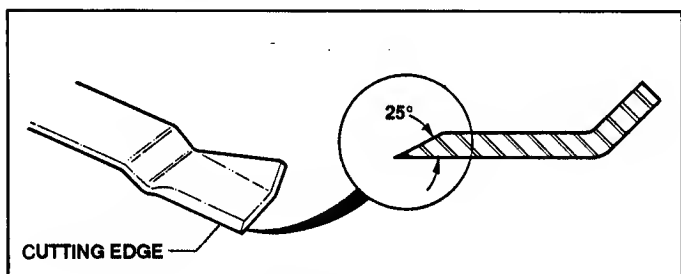


FIGURE 11.13

- Use a commercial balancer to check blade balances. Follow balancer manufacturer's instructions. If out of balance, grind metal from the **HEAVY END** of the blade. Recheck balance until correct.
- After sharpening and balancing blade, reinstall blade and blade components in reverse order. Torque blade bolt per chart below.

CAUTION

*Never install an out of balance blade !
An out of balance blade will cause excessive vibration resulting in premature wear and damage to the deck and its components.*

BLADE BOLT TORQUE CHART

Deck No.	Cutting Width	Blade Bolt Torque
Z4102M	41"	30 ft. lbs.
Z4202M	42"	60 ft. lbs.
Z4802M	48"	60 ft. lbs.
Z6002M	60"	60 ft. lbs.
ZU4804M	48"	60 ft. lbs.
ZU6004M	60"	60 ft. lbs.

C. DECK SPINDLE OVERHAUL

CAUTION!

Always remove ignition key and disconnect spark plug wires before performing any service on deck.

When overhauling a deck spindle assembly, it is not necessary to remove the spindle housing from the deck. Proceed as follows:

- Remove the grease fitting, spindle pulley nut and washers.
- Remove the spindle pulley and woodruff key.
- Remove the blade.
- Remove the blade spacer and lower woodruff key.
- Remove the drive screw from the lower part of spindle housing.
- Remove the internal bore snap ring from the bottom of the spindle housing. See Figure 11.14.

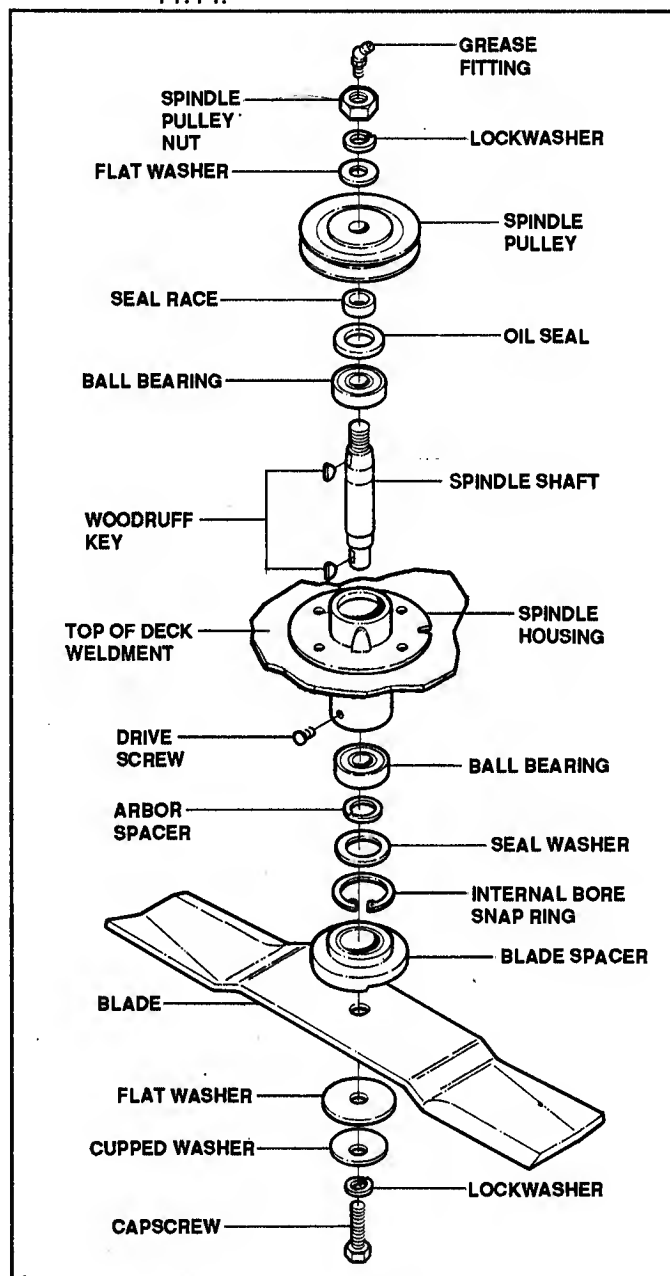


FIGURE 11.14

- Reinstall the spindle pulley nut flush with the top of the spindle.
- Using a soft face mallet, carefully drive the spindle, lower bearing, arbor spacer and seal washer but through the bottom of the spindle housing.
- Remove spindle pulley nut.
- The remaining components can now be removed from the spindle shaft.

Section XI - CUTTER UNITS ADJUSTMENTS & REPAIRS

D. DECK SPINDLE REASSEMBLY

Carefully clean all parts! Remove any burrs which may be inside the spindle housing and check the spindle shaft for any damage.

1. Lubricate all parts before assembly.
2. Install spindle shaft into housing using new parts as required.
3. Install blade as shown in Figure 11.14. Finger tighten capscrew.
4. Add spindle pulley and fasteners to top of spindle shaft (use new spindle nut).
5. Tighten blade bolt to specified torque value. (See "Blade Bolt Torque Chart").
6. Tighten spindle nut.

E. DOUBLE IDLER

The double idler described in the following text are found on units dating from 1988 thru 1994. All of these double idlers are different in one way or the other and care should be taken not to interchange pertinent parts from one model to another during replacement or repair.

1. 1988 thru early 1990 DOUBLE IDLER

- (a) Parts for the 1988 thru early 1990 double idler are shown below in Figure 11.15. Those parts called out with part numbers CANNOT be interchanged with a different model deck!

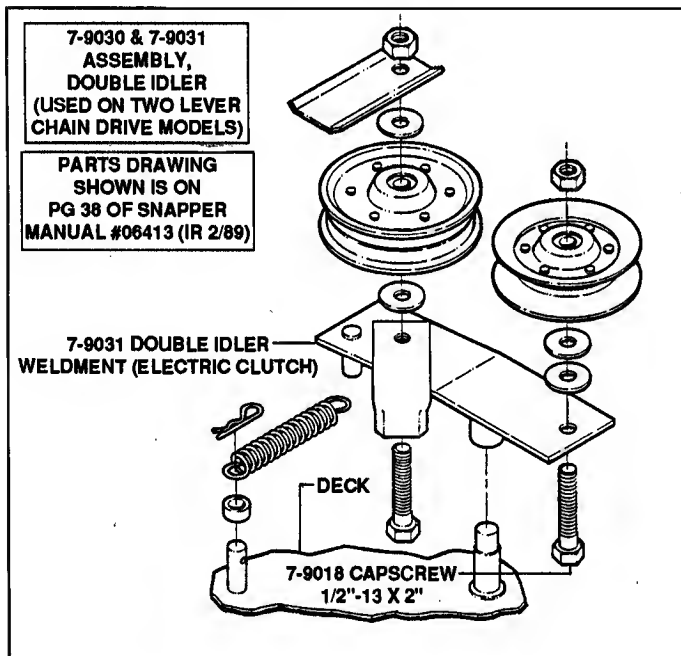


FIGURE 11.15

- (b) A common problem encountered with the 1988-90 double idler weldment is that someone, at some time, has taken the bend out of the flat part of the idler weldment. For those decks requiring this idler assembly, the idler weldment MUST BE ANGLED DOWN FIVE DEGREES (5°). See Figure 11.16.

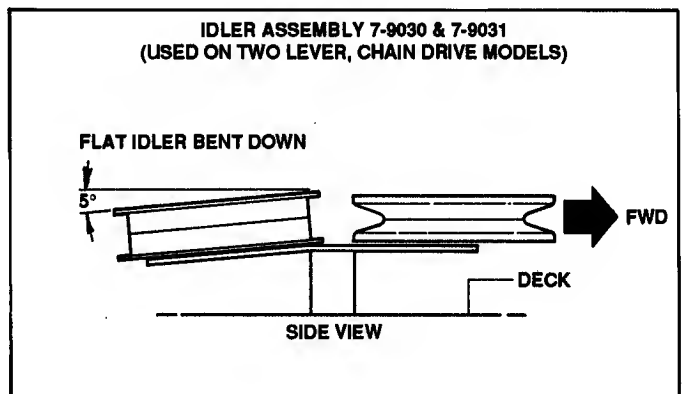


FIGURE 11.16

If the flat idler is not set at five degrees (Refer to Figure 11.16), then the deck drive belt will become frayed, broken or loose from the drive pulley.

- (c) Earlier models (1988-1990) were also fitted with Aetna™ flat idler pulleys. These should be replaced with Myers™ pulleys whenever the idler assembly is overhauled.

2. 1990 thru early 1991 DOUBLE IDLER

- (a) In appearance, the 1990 thru early 1991 double idler appears to be the same as the 1988-1990 model. It is not. The major differences are indicated by those parts called out with part numbers in Figure 11.17.

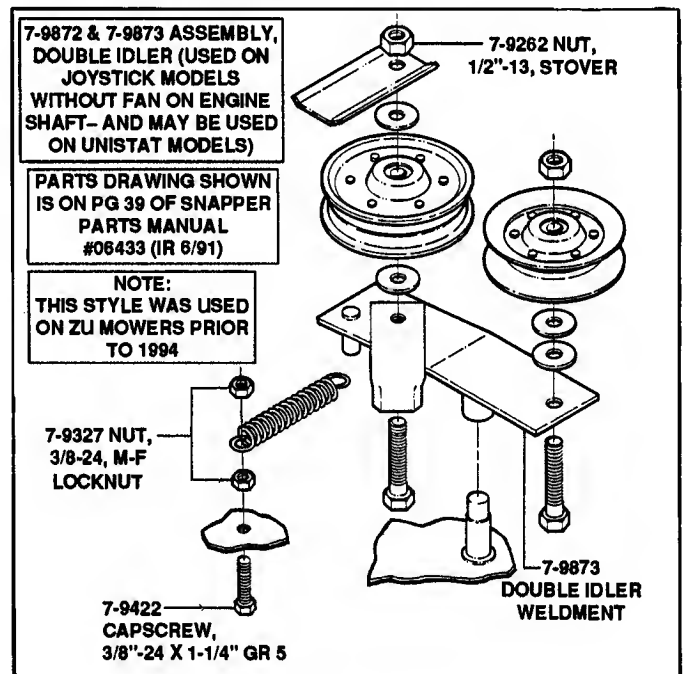


FIGURE 11.17

- (b) The 1990 thru early 1991 double idler weldments MUST BE ANGLED UP SEVEN DEGREES (7°) in order for the deck drive belt to function properly. See Figure 11.18.

Section X - CUTTER UNITS ADJUSTMENTS & REPAIRS

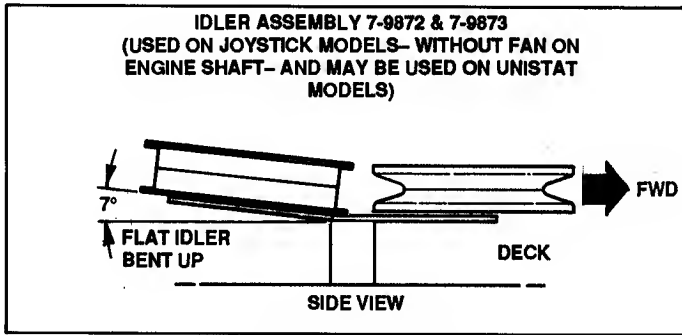


FIGURE 11.18

3. Late 1991 and on DOUBLE IDLER (Z Series)

- (a) The late 1991 and on double idler bracket (as shown in Figure 11.19) is for use on joystick models of the unit (with fan on engine shaft) and is the preferred idler for older unistat models.

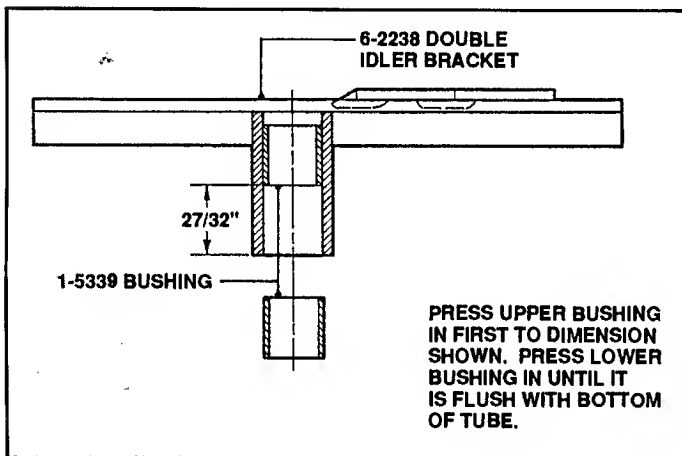
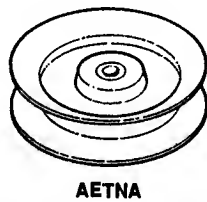
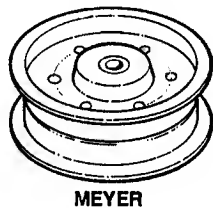


FIGURE 11.19

NOTE

When overhauling any double idler assembly, replace the FLAT Aetna™ pulley with a Myers™ pulley.



4. 1994 DOUBLE IDLER

- (a) Shown in Figure 10.20 is the type double idler in present use on Model ZU units. This is shown for assembly sequence only. Refer to SNAPPER Parts Manual (#06434 (Rev.1, 1/94) for parts numbers.

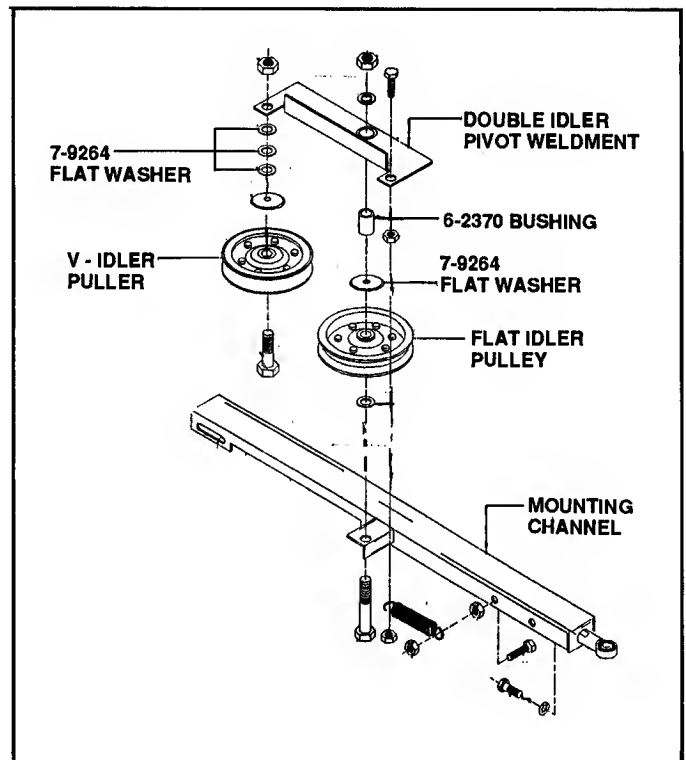


FIGURE 11.20

- (b) Because of the configuration of the 1994 (and later) double idler bracket, there should be no problem of deformation of the bracket. The only parts requiring replacement should be the bushing, washers, spring, and pulleys.

F. SINGLE IDLER PULLEY

The following information covering the single idler pulley is generic to all models of the Zero Turning Radius Mowers.

1. Shown below (Figure 11.21) is a typical single idler assembly. Replaceable parts are the bushing, spring, pulley and some hardware - the single arm weldment should seldom need replacing.

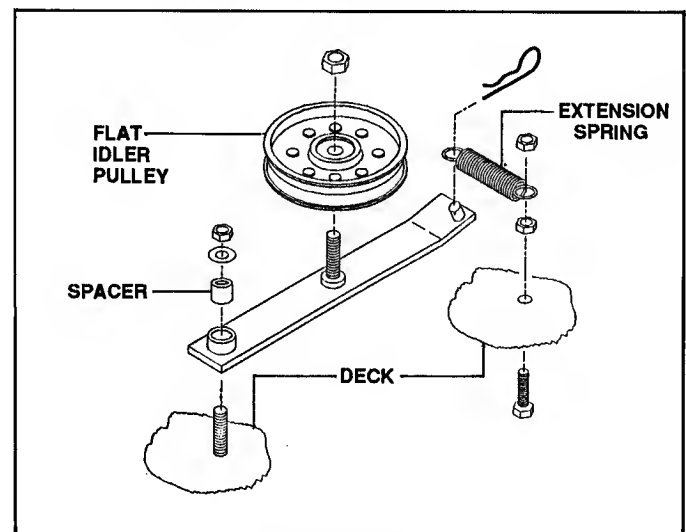


FIGURE 11.21

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2. Earlier Z and ZU models used a stationary deck pin, spacer and clevis pin for mounting the extension spring to the mower deck.

G. DECK ROLLER (48" & 60" DECK)

The deck rollers are simple to replace or repair. Shown in Figure 11.22 are the basic roller parts found on most Z and ZU mower decks.

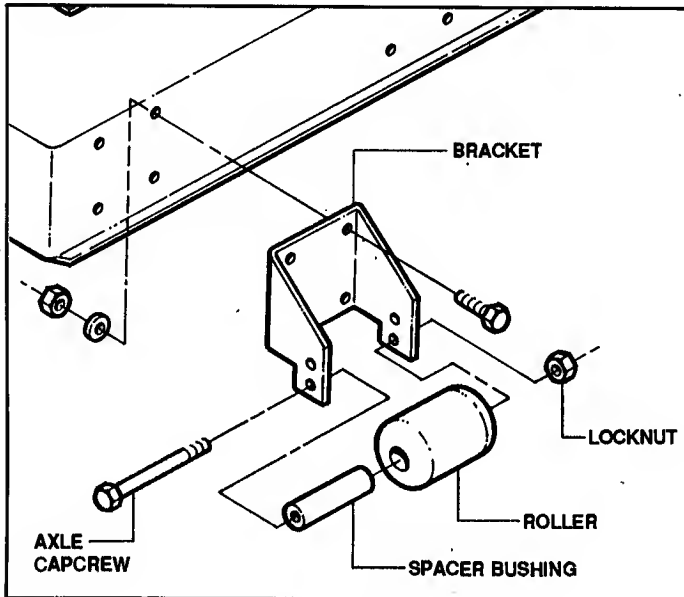


FIGURE 11.22

1. Replacement of the roller, spacer bushing or axle (capcrew) are as shown in the above illustration.
2. If replacing the bracket, make sure to install the roller at the same height as the other deck rollers.

H. DECK CASTER WHEEL (60" DECK)

1. REMOVAL (For Bearing Replacement)

- (a) Raise mower deck to highest position.
- (b) Place block of wood under front of deck for safety support.
- (c) Remove 1/4" Hex Screw from top of bearing cap. See Figure 11.23.
- (d) Remove bearing cap.
- (e) Tap on top of shaft to remove swivel yoke and roller assembly.
- (f) Drive both bearings out of bracket bore. Discard bearings.

2. CLEANING & INSPECTION

- (a) Wipe out old grease from bracket bore.
- (b) Clean the swivel yoke shaft, then coat lightly with grease.
- (c) Inspect the bracket bore, swivel yoke shaft and roller for signs of wear or damage. Replace parts as required.

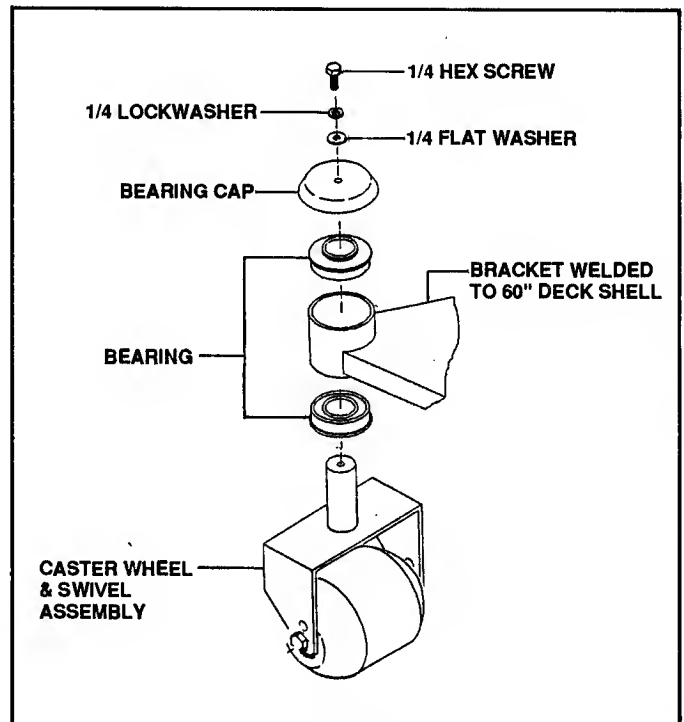


FIGURE 11.23

3. REASSEMBLY

- (a) Apply grease to all wear points of components.
- (b) Press in new bearings and reassemble components in reverse order.

11.7 DECK LIP & DUST BAFFLES

The major functional difference between the lip baffle and the newer dust baffle is as follows:

A. LIP BAFFLE (Standard Kit)

Best baffle for use in lush grass during summer and fall.

B. DUST BAFFLE (New Kit)

1. This baffle prevents dusting conditions during arid times of year.
2. Pulls dust into mower deck and out discharge chute.

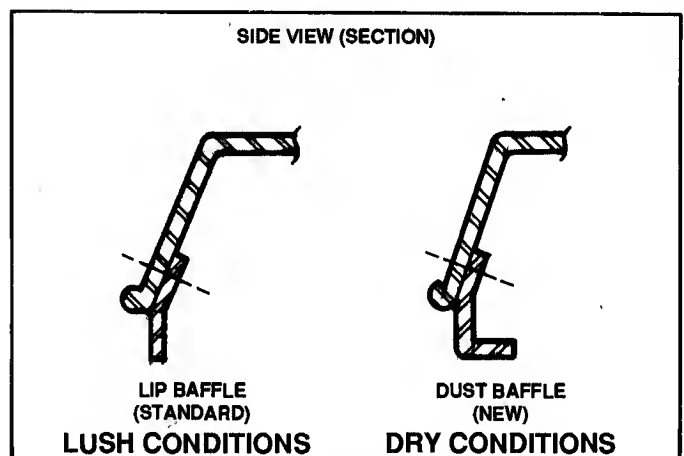


FIGURE 11.24

Section XI - CUTTER UNITS ADJUSTMENTS & REPAIRS

3. The chart shown below lists the different lip baffles and dust baffle kits and their respective part numbers.

BAFFLE PARTS & KITS		
PART No.	DESCRIPTION	
6-2405	Lip baffle ext. 42" L.H.	
6-2406	Lip baffle ext. 42" & 48" R.H.	
6-2407	Lip baffle ext. 48" L.H.	
6-2408	Lip baffle ext. 60" L.H.	
6-2409	Lip baffle ext. 60" R.H.	
6-2410	Lip baffle ext. 48" UNISTAT L.H.	
6-2411	Lip baffle ext. 48" UNISTAT R.H.	
6-2412	Lip baffle ext. 60" UNISTAT L.H.	
6-2413	Lip baffle ext. 60" UNISTAT R.H.	
6-2414	Dust baffle ext. KIT 42" DECK	RED DECK
6-2415	Dust baffle ext. KIT 48" DECK	
6-2416	Dust baffle ext. KIT 60" DECK	
6-2417	Dust baffle ext. KIT 48" UNISTAT	BLACK DECK
6-2418	Dust baffle ext. KIT 60" UNISTAT	

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ZTR Zero Turning Radius Mower Service Manual